ENGINEERING LITERATURE

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The History of Engineering proposed by Mr. Waddell, in the paper reprinted in this Supplement, has much to commend it. How such a history could best be written is a serious question. The plan suggested in the paper, which may probably be considered as tentative only, has some decided advantages, but it is questionable whether or not the best results could be secured by a board of editors, with numerous contributors working under editorial direction, and conscious that their writings were to be subject to wholesale revision. Not but that such revision would be highly desirable if the many-contributors plan were to be adopted, but it would tend to dishearten prospective contributors. It would certainly require great literary skill on the part of any board of editors to bring twenty or more separate contributions into harmony. On the other hand, a good History of Engineering would involve so much time, knowledge, and literary ability as to be far beyond the capabilities of most writers.

Whatever plan of authorship might be adopted, there would be danger of the final production proving to be a collection of histories of many branches of engineering, and an assemblage of biographies of engineers. In fact, we may go further and say that the more specialized the treatment the more likelihood would there be of producing, not a history, nor even a series of histories and biographies, but instead a cyclopedia of engineering. A careful study of Mr. Waddell's paper will show that this is not what he desires. He appears to have in mind a history brief enough to serve as a college text-book, yet sufficiently comprehensive and vital to attract, hold, and inspire both the student and the engineer. This we believe to be essential, but before it can be brought about it may be necessary to follow or expand the plan suggested by Professor Merriman at the convention of the Society for the Promotion of Engineering Education (see Eng. News, July 9, 1903, p. 35. That plan was to have one or two historical papers laid before the society each year. If this idea were adopted by other societies as well, including national, state, and even the more local organizations, and if all such bodies would take more pains to collect and preserve both descriptive and biographical material, the way would be cleared for a History of Engineering that would be a credit and an inspiration to the profession.

The value and need of a good command of the English language on the part of the engineer are being urged with increasing frequency in addresses to engineering students and in discussions before engineering societies. What equipment can the engineer have that will prove of more value to him than the ability to speak and write clearly and forcibly? and yet how inadequately is English taught in most schools and colleges! The deficiencies in this respect are more marked, as a rule, in the engineering than in the so-called academic departments, but the latter are by no means free from cause for complaint.

One of the advantages of the more general course of study is that it brings the student into a far more intimate relation with good literature than do the technical courses. Those who belittle the broader schooling, including the study of literature, sometimes argue of late that the best way to teach engineering students the use of good English is to set them to reading the specifications, reports and other writings of engineers who show a particularly good command of their own language. That there are such writings and that their perusal and study would aid in forming a good style we do not deny. It should, however, devolve upon the advocates of such a plan to name these masterpieces of engineering literature and to prove that the reading thereof could supplant—in fact, more than slightly supplement—other well tried means of acquiring proficiency in language.

The truth of the matter seems to be that there is no short and easy route to the mastery of English language. Training begins, for good or ill, almost unconsciously, in the home. It is continued, more or less consciously, through school and college. One-tenth of what one acquires is by rule and drill and nine-tenths by imitation; and of the influence tending to benefit through imitation, when infancy and early youth are passed, none are so potent as reading the works of past and present masters of good literature.

Reading of this sort is rarely prompted by a desire to acquire literary style, and certainly such of it as is most beneficial to the reader's own style is read for the love of it. The effort of instructors should be to foster, or if necessary to help create, a love for good literature, and not to condemn it and grind the student down to technical studies, only. Finally, as bearing on the use of engineering literature to teach correct and forcible English, it may be said that publishers of general literature complain bitterly of the character of the English commonly found in technical books submitted for publication.

Where shall State road improvement literature stop? This question is prompted by the bulletin on "Highway Construction in Wisconsin," which it has seemed necessary to criticise adversely and at some length in this Supplement, and by many statements in it to which exception is taken by one of our correspondents. A number of States have published general reports on highway construction, not including the annual reports of State Highway Commissioners. These general reports have been confined chiefly to a description of the highways, and mostly to the country roads of the State in question, and to the most available materials for the construction of improved roads. The Wisconsin report just mentioned goes further than this, and presents a discussion of the various phases of paving material, going over ground already well covered in various excellent treatises and monographs on pavements and roads. Probably going so far afield would not have attracted much attention, at least outside of Wisconsin, had not the general discussion given occasion for so much unfavorable criticism. But now that the bulletin is causing so much comment, it may well be asked, why should any of our States publish engineering treatises?

Concrete evidence of the specialization of knowledge and industry, and of the value of intelligent, united effort, is afforded by the new edition of the "Car Builders' Dictionary," reviewed in this issue. This large volume is devoted to the one subject of cars and car-building, not including electric railway cars. It was first published in 1880, after some eight years of committee work, and has since been revised several times. It owes its inception and continued revision to the Master Car Builders' Association, but doubtless much of its success should be attributed to the publishers. There is plenty of opportunity for similar work in other technical fields and by other societies.

The volume entitled "London Statistics," noticed elsewhere in this issue, brings to mind the fact that none of the American cities publish annuals similar to those of many of the leading cities of Europe. Boston took the lead in establishing a statistical department, and some central statistical work has been done at Chicago and Baltimore, but in none of these cities have there been provided the necessary staff and funds to carry out such comprehensive work as is done abroad. The original charter of Greater New York provided for a statistical department, and one was organized under Mayor Van Wyck, but the administration seemed to think that the work of the department did not go beyond preparing reams of blank forms, collecting such information as the other city departments saw fit to give, and drawing salaries. With the revised charter which went into effect some two years ago the statistical department was abolished. A substitute has been provided as a division of one of the other municipal departments, and when it is heard from perhaps there will be one American city in a position to exchange with the statistical annuals of European municipalities.

The London publication already noted has some glaring deficiencies, as its authors point out. In some branches the latest complete returns are for the year 1897-8, and in others no satisfactory figures for any date are available. One of the worst faults of the European annuals is the delay in their publication. This is largely due to the desire to secure returns for every department before publishing the statistics for a given year. The London County Council announces that hereafter it will publish within the year such returns as are available, and let the others wait until a later volume. This is commendable.

While American cities cannot show statistical year books like those so well established in Europe an increasing number of cities have municipal departments which issue very creditable annual reports; for the most part with a fair degree of promptness. Many cities publish hand-books which range all the way from directories of municipal officials to valuable manuals or compendiums. An instance of private enterprise is the little volume entitled "Hartford Information," noted in this issue. This manual contains few statistics, but it does tell many things which every citizen ought, or may at any time wish, to know.

CORRESPONDENCE.

Guy's Experiments on the Flexure of Beams.

Sir: It seems to me that your review of Mr. A. E. Guy's book, "Experiments on the Flexure of Beams," does not do the book justice. It is true, as your review says, that these experiments "have not yet proceeded far enough to satisfy the needs of the engineer," but in spite of this I look upon the book as the most important contribution to the subject of the strength of beams that has been made for many years.

So far as I am aware, Mr. Guy is the first to take up the systematic study of the failure of beams when so long as to give way by buckling, as he is certainly the first to discover the laws of failure in that manner.

It is true his experiments were made upon models, but he has nevertheless disclosed a complete set of the laws of failure in this manner, and has developed equations, the agreement between which and his observations is nothing less than remarkable. He has, moreover, shown the limiting condition between failure by the method usually assumed and failure by buckling.

While the fact that the experiments were made upon models must limit the confidence with which these equations can be applied, nevertheless the use of equations arrived at in this manner is certainly better than guesswork or empiricism.

It is not, however, so much from the standpoint of actual usefulness, in which Mr. Guy's experiments are limited by their having been made upon models, as from the standpoint of advancing our fundamental knowledge of the principles of failure by buckling that Mr. Guy's book is to be judged. From this standpoint it breaks new ground, discloses new laws, furnishes equations which were hitherto unsuspected, and is a book which I believe will, in the future, be looked upon as a classic in its field. To have discovered that Euler's formula applies to long beams as well as columns, and that whether horizontal or inclined, is, I take it, sufficient for one set of experiments. How many have done more?

Very truly yours, F. A. Halsey.

World Building, New York, June 19, 1903.

Highway Construction in Wisconsin.

Sir: I wish to call attention to some errors in Dr. Buckley's recent bulletin on Highway Construction in Wisconsin.

In Chapter VI. of the bulletin, which is entitled "Abrasion and Cementation Tests," the writer makes the following statement:

> The tests were made precisely similar to those made by the Massachusetts Highway Commission and the Maryland Geological Survey. A special effort was made to have the conditions uniform, and to follow closely the conditions prescribed by the Massachusetts Highway Commission, which was the first in the United States to adopt these tests, and whose methods have been taken as a standard wherever such tests have been made in this country. By following this method results were obtained which were not only comparable with one another, but also comparable with tests made elsewhere.

He then gives a description of the abrasion test, chiefly quoted from the Maryland Geological Survey and the Massachusetts Highway Commission reports, and closes by saying:

> The coefficient of wear given in the table is the rather arbitrary coefficient adopted by the National School of Roads and Bridges of France. It is expressed by the formula

$$\text{Coefficient of wear} = \frac{400}{w}$$

where "w" is the weight in grams of the dust which passes through a sixteenth-inch mesh sieve.

Just how the writer could have made such a serious error as this, I am unable to say. He doubtless got his information in regard to this test from a report that I made to the Massachusetts Highway Commission in 1900, in which I make the following statement:

> The number 20 was adopted as a standard of excellence and the coefficient of wear for any stone tested may be obtained by the formula:—

$$\text{Coefficient of wear} = 20 \times \frac{20}{w} = \frac{400}{w}$$

where w is the weight in grams of detritus under .16 cm (1/16 inch) in size obtained per kg. (2.2 pounds) of rock used.

Had he referred to original sources for his information, he would have found a ministerial circular of March, 1878, entitled "Routes Nationales. Détermination Directe de la Qualite des Materiaux D'Entretien." Paris, 1880. From an examination of this circular it can readily be seen that Dr. Buckley has failed to see that the formula given therein considers the number of grammes per kilogramme of rock used; therefore if his results were multiplied by five they would be correct, and would be "comparable with results made elsewhere." At present they are certainly not. Despite this fact, however, he states on p. 298 that:

> The abrasion tests were very satisfactory. Not only did the different tests of the same sample agree with one another, but the tests of the various samples of the same class of stone showed a very satisfactory agreement.

Such a broad statement as this is entirely unwarrantable on the small number of results obtained, and is not true of the abrasion test. It is familiar to any one who has studied rocks, that the physical and mechanical properties of the same class vary enormously, and an inspection of Dr. Buckley's table of results shows this to be the case. As an example of this variation on rock tested in this laboratory, from 14 samples of diabase (trap) I get a maximum coefficient of 34.5 and a minimum of 6.4; with 15 samples of dolomite, maximum 16.1, minimum 2.2; with 15 samples of granite, maximum 21.7, minimum 2.7; with 46 samples of limestone, maximum 14.2, minimum 1.2. The same has been the experience of other laboratories in this country as well as of the French School of Roads and Bridges.

In describing his tests on the cementing value of rock dust, he states that

> The Massachusetts Highway Commission, after experimenting for five years to determine a suitable means of testing this property, finally adopted the Page impact test for dust briquettes.

This is completely new to me. I was with the Massachusetts Highway Commission from the time it was founded in 1893 until 1900, and conducted all the tests for the Commission at Harvard University. I began this cementation test for the Commission in 1893 and it was adopted by the Commission as much then as at any subsequent time. The method of making the briquettes that Dr. Buckley describes is one which I used a number of years ago, and had he cared to ascertain the methods at present in use either at this laboratory or that of the Maryland Geological Survey, his results might have been different. He says: "The results obtained from the impact test were not so satisfactory." In this I fully agree with him. Further on he says, "The results were no more erratic than those obtained elsewhere with the machine and it seems as though the same criticism might be made on the results obtained elsewhere." On what grounds he bases this statement is more than I can say. I am very familiar with the results obtained elsewhere and have made many thousand tests in this laboratory, and am forced to say that such a conclusion is without foundation.

In a foot note on p. 298 the writer says,

> Since writing this, announcement has been made that the Page impact machine and the manner of making briquettes have been improved by Mr. A. N. Johnson of the Maryland Geological Survey, so that reliable determinations of the cementing properties of crushed stone can be obtained.

I have just spoken to Mr. A. N. Johnson of the Maryland Geological Survey in regard to this announcement and he assures me that he knows nothing of it, and I have been unable to find it myself.

No claim has ever been made that the cementation test gives results of great precision, nor are such results desirable. It distinguishes between rocks of excellent, good, fair and bad cementing values, and is of the greatest practical assistance in selecting materials. On the whole it is no more erratic than the tensile test of Portland cement.

Respectfully, Logan Waller Page.
Chief of Road Material Laboratory.

U. S. Department of Agriculture, Washington, D. C., July 8, 1902.

(As will be seen from our review of the Wisconsin report, elsewhere in this Supplement, and as Mr. Page says at the beginning of his letter, the bulletin contains much information of local value. It also contains other *misinformation* than that mentioned by Mr. Page. The attempt to go into engineering discussions of the principles of pavement construction in general has led to some editorial remarks on the page preceding this one, beginning "Where shall State road improvement literature stop?"—Ed.)

PUBLICATIONS OF THE EARTHQUAKE INVESTIGATION COMMITTEE, IN FOREIGN LANGUAGES. No. 12. Tokyo, Japan: The Committee. Paper; 7 × 10 ins.; pp. 55; illustrated.

This issue is a continuation of previously published papers upon earthquake action in Japan, and a description of new instruments and methods employed. The first paper records results obtained with the horizontal pendulum tromometer, an instrument intended to register only very small horizontal movements of the ground. Succeeding papers treat of the overturning and sliding of columns and the sliding of bodies resting on the ground; the vibration of chimneys and the vibration of railway bridge piers. In each case the instruments used are illustrated, and the methods described, while tables and diagrams show results. All of the papers are by Mr. F. Omori.

The Advisability of Instructing Engineering Students in the History of the Engineering Profession.*

By J. A. L. Waddell,† M. Am. Soc. C. E.

The absolute ignorance of students at engineering schools, of young engineers, and, it must be confessed, also of many old members of the engineering profession, concerning the history of civil engineering and the names of the prominent engineers of past and present times is simply astounding!

Why should such a deplorable state of affairs exist?

Some may say "Because ours is such a recent profession, it being in fact the youngest of all the learned professions." Although in one sense this statement may be correct, still the excuse will not suffice; for civil engineering is in fact one of the oldest, if not actually the very oldest, of all the professions. In prehistoric times the men who dammed water to irrigate their fields, or who crossed streams by felling trees or by piling rocks in their beds for stepping stones, were certainly the engineers of those days—and it is more than likely that there were then no lawyers, doctors or clergymen, because law, medicine and religion were probably unknown.

Others may reply "Ours is such a busy profession that its members are ever occupied with the present and looking to the future, so have no time to spare for considering the past." This is a good reason but a poor excuse. Moreover, now that the general public recognizes engineering as one of the learned professions, it behooves its members to become conversant with its history and development and familiar with the names and careers of its most prominent men.

Others may say "The blame lies with the professors of engineering in the technical schools, who pay no attention to such matters as engineering history." This is true in a way; but the professors might reply "There is no time in the curriculum to devote to such matters, for there is already more in our courses than can be crowded into the allotted time"—a lame excuse, indeed, because either the time should be increased or something of less importance should be left out—preferably the former. Or the professors might answer "How can we teach the history of engineering when there is not a single book of any value upon the subject, and when we ourselves are nearly as ignorant thereon as our own students?"

Now we are arriving at the gist of the matter; for if there were in existence a thorough, reliable and exhaustive history of civil engineering, it is probable that every professor in every technical school would use it to a greater or less extent, and most of them would adopt it as a text book.

But who is to undertake the stupendous task of writing such a treatise? No one man could do it in any reasonable time; and, moreover, no one man is capable of doing it properly; so, if the book be written at all, it must be prepared by a combination of writers.

Now what combination of engineers and technical writers is as well fitted for such work as the members of the Society for the Promotion of Engineering Education?

And what a grand enterprise it would be for this Society, one that would make it famous for several generations throughout the entire English-speaking world. Aye—more than that—throughout the whole civilized world, because such a valuable book would certainly be translated sooner or later into the principal foreign languages.

Such being the case, let this society appoint a committee to first consider the advisability of the society as a body undertaking the writing and publication of "The History of Civil Engineering," using the latter term in its broad sense so as to cover all branches of engineering except the military; and, if the decision of the committee be favorable to the suggested publication, let it out-

*Paper read before the Society for the Promotion of Engineering Education, at its Convention at Niagara Falls, N. Y., July 1-3, 1903.

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line in its report a policy and modus operandi for the society to follow in order to produce the best possible history in the reasonably shortest time.

The following are some suggestions that the writer would offer concerning the proposed work.

(1) That the subject of civil engineering be divided into a number of heads or topics representing the different kinds of engineering work, and that these be apportioned among the members of the society, one topic being given to one member, or perhaps in certain cases to two or more.

The following is offered as a preliminary list of topics, to be amended or increased as may seem good to the committee:

Bridges.	Power Transmission.
Concrete and Cement.	Railroading.
Dams.	Rivers and Canals.
Electrical Engineering.	Roads, Streets and Pavements.
Engineering Education.	Roofs.
Foundations.	Sewerage and Sanitary Engineering.
Gas Motors.	Ship-Building.
Harbors.	Steam Engines.
Hydraulic Motors.	Steel Buildings.
Landscape Engineering.	Surveying and Geodesy.
Manufacture of Iron and Steel.	Tunnels.
Masonry.	Water Supply.
Mechanical Engineering.	Wind Motors.
Mining Engineering.	

It is to be noticed that this list is made alphabetically, which is the arrangement that the writer would suggest for the book.

(2) That an editing committee of three be appointed to choose the various writers, apportion their subjects, limit the number of words and illustrations for each subject, check, correct and finally approve each finished paper, and attend to the publishing of the entire book, the proofreading of each article, however, being left to the writer thereof.

(3) That the committee collect to as great an extent as possible the portraits of the leading engineers of the past, and reproduce them throughout the book in the papers devoted to their principal specialties or finished constructions.

(4) That the committee collect also photographs of a number of the principal constructions pertaining to each division of the book, and use them for illustration.

(5) That the various writers be advised to call for suggestions or aid on their work from other engineers, whether the latter be members of the Society for the Promotion of Engineering Education or not, and from the various engineering societies both at home and abroad.

(6) All papers should be written with the understanding that the main usefulness of the book will be through its perusal by students in technical schools.

(7) It will be necessary for all writers to treat as fully as practicable the work of foreign engineers as well as that of their American brethren.

(8) Only reasonably authentic history should be given; and wherever there is any doubt whatsoever concerning the correctness of any statement, the said doubt should be clearly indicated, and the source of information stated.

(9) The book throughout should be written in a most readable style. It should be thorough, concise, accurate and complete without being too lengthy.

(10) The various writers should keep in close touch with the editing committee as their work progresses, so as to avoid to as great an extent as possible the necessity for changes.

(11) No expense should be spared to make the book complete and to publish it in first-class style.

(12) The selling price should be made a minimum; and if eventually there be any profit it should be divided into two equal parts, one part going to the general fund of the society, and the other being divided equally among the writers of the various papers, including, of course, the editing committee.

(13) All actual cash expenditures by the writers in preparing their papers should be repaid immediately by the society from a preliminary fund established for the purpose. This fund should be used also in securing portraits of the old engineers and photographs of important engineering constructions.

(14) It would not take a large sum of money to publish the work, because the type-setting, paper, printing and binding need not be paid for till after the book is issued; and the initial sales would certainly cover all such expenses.

(15) The sale of the book, even at the outset, would be immense; and afterwards the demand would be both large and constant, rendering the venture a financial success and the work the most popular and widely used of all engineering treatises.

A Huge Volume of Corporation Statistics.

MOODY'S MANUAL OF CORPORATION STATISTICS.—Fourth Annual Number; 1903. John Moody, Editor; C. L. F. Bridge, Louis W. Holschuh, Associate Editors. New York: Moody Publishing Co. Cloth; 6×9 ins.; pp., 2345. $7.50.

This huge volume contains information designed primarily for dealers and investors in the stock and bonds of North American steam and electric railway, lighting and water companies, mining and numerous other industrial corporations. There are also sections on American and foreign government securities, bonds and trust companies, and the "Choice of a Corporate Home." An appendix devoted to "Industrial Trusts" gives the name, date and State of incorporation and authorized capitalization of 235 concerns, with an aggregate stock and bond issuing power, provided the investing public will take the bait, of $6,506,013,500. Another appendix gives, in three separate lists, the name, population, and assessed valuation of a portion of the cities and towns in the United States having municipal water-works, electric light, and gas plants; also the superintendents of most of the plants. Further reference to these lists may be found below.

Two convenient features of the work are an alphabetical index, and an index by cities.

In general, the main divisions of the book appear to follow the plan adopted for the first three issues. Water-works companies are still scantily represented, only 78 out of upwards of 1,600 being listed. The omissions include the companies at Portland, Me., and Oakland, Cal., the East Jersey Water Co., with its large interests in New Jersey, and the American Water-Works & Guarantee Co., of Pittsburg, which last is probably the largest parent or operating water company in the country.

By a strange coincidence the information given in the 21 pages on "Municipal Water and Lighting Plants" appears to be identical in every respect with that contained in our own "Municipal Year Book" for 1902, although it is given in a different form. The "Year Book" was compiled from returns made in 1901, most of which were revised just prior to publication early in 1902. Since our returns were received there must have been some changes in the superintendents of the various plants, but this 1903 "Manual" gives the same names as appear in the "Year Book," and where no name is given in the "Year Book" there is none in the "Manual." At least this is the case for Iowa and some other States. Moreover, the assessed valuations given in the "Year Book" were generally for the year 1901, and where earlier figures were reported it was so stated. This "Manual" for 1903 gives the same figures as the "Year Book" for 1902, even when the latter were as old as 1899. Where no valuations were given in the earlier publication there are none in the later one.

Is the whole book made up in like manner? Apparently not, for there is evidence of original returns at some other points, but the showing for the section in question, combined with the fact that no credit is given to "The Year Book." naturally raises a question as to the origin and the date of much of the other information in this "Manual."

PETROLEUM BIBLIOGRAPHY.—Literature available in the Mechanics' Institute Library, San Francisco, Cal.; with Some References on Asphaltum. Prepared by Frederick T. Teggart, Librarian. San Francisco: The Library. Paper; 6 × 8 ins.; pp. 24.

This is an author-index, only, and therefore fills only a part of the need of those using the library. Other lists are under way, on Landscape Gardening, Forestry, and Irrigation, and still others are planned. It is to be hoped that subject-indexes will be included in future issues.

A Review of Railway Legislation in the United States.

RAILWAY LEGISLATION IN THE UNITED STATES.—By Balthasar Henry Meyer, Ph.D., Professor of Institutes of Commerce, University of Wisconsin. New York: The Macmillan Co. Half leather; 5 × 8 ins.; pp. 329. $1.25 net; by mail, $1.35.

This volmue deals chiefly with facts rather than theories. It presents in condensed form the most notable features of State and National legislation on railways within the United States, including under national legislation brief analyses of the leading decisions of the Interstate Commerce Commission.

In the introduction there are, first, a few pages on "The Significance of Railways," after which the author presents the main characteristics of railway legislation in this and foreign countries, and discusses the economic adjustments effected and made desirable through the advent of the railway. Three propositions which the author regards as incontrovertible are as follows:

(1) That the present situation with respect to railway affairs in the United States is untenable and indefensible.

(2) That the great majority of the railway managers and other railway officials are sincerely desirous of administering, to the best of their abilities, the properties under their control in the most efficient manner, having due regard for the interests of both the stockholders and the public; but that all the various interests affected by their action are not represented in proportion to their importance, if at all; and that consequently injustice may be done.

(3) That there is nothing in the present statutory and administrative regulation of railways to prevent the arbitrary and harmful action of the weak or unscrupulous manager from defeating the desires of the majority of the officials who would voluntarily pursue a more beneficent course.

Believing that both the public and the railway officials have frequently evinced a desire to get together, and have made numerous attempts to, that end, the author suggests, chiefly for discussion, a legally established

system of state and interstate councils, having advisory power only, and representing all the various interests of the entire population as far as practicable.

Both the railways and the people should be represented. The elective principle might be adopted to insure popular representation and the appointive principle "to secure expert knowledge and specialized efficiency." The council would be a sort of a "get-together" medium, on a carefully organized basis, and one of its chief aims would be to secure facts on which just action by the railways and by legislative and judicial bodies, might be based.

As already intimated, the author does not dwell long on such discussions as that just outlined, His whole introduction occupies only 49 pages, a portion of which, as we have already seen, is devoted to actual legislation. The main part of the book is on "The Progress of Railway Legislation." Here early railway charters, later charters and early general laws, constitutional provisions, and the general railway legislation of the present day, all as found in the statutes and constitutions of the several States, are analyzed in more or less detail. Next comes a section on the Commerce Commission, its decisions, and the decisions of the U. S. Supreme Court bearing upon the latter.

The first of a number of appendices gives the charter of the Baltimore & Ohio Railroad Co., which was an act of the General Assembly of Maryland, passed Feb. 28, 1827. A second appendix gives, as an example of a recent incorporation under general laws, the articles of association of the Southern Railway Co. There are also a number of other reprints of State or national enactments pertinent to the subject of this volume. The large amount of labor necessary to the production of such a digest as this seems to have been carefully done. The book promises to be a useful contribution to that rapidly growing volume of time-saving literature which is one of the most striking needs of the day.

SOME ENGINEERING FEATURES OF DRAINAGE.—By C. G. Elliott, Drainage Expert, Office of Experiment Stations. Reprinted from Year-Book of the Department of Agriculture for 1902. Washington: Pub. Doc. Paper; 6 × 9 ins.; pp. 16; three illustrations.

This paper relates almost wholly to the drainage of irrigated lands. The advantages and some of the principles governing the practice are stated, and a few details of construction are given.

A Cyclopedic Treatise on Telephone Engineering.

TELEPHONY.—A Manual of the Design, Construction and Operation of Telephone Exchanges. By Arthur Vaughan Abbott, C. E. New York: McGraw Publishing Co. Cloth; 6 × 9 ins.; tables and illustrations. In Six Parts. Part I.: The Location of Central Offices; pp. 155; 33 illustrations. Part II.: The Construction of Underground Conduits; pp. 180; 62 illustrations. Part III.: The Cable Plant; pp. 142; 52 illustrations. $1.50 each, or $6 for the six volumes.

The Century Dictionary gives us the following definition:

MANUAL.—A small book, such as may be carried in the hand or conveniently handled; especially, a book of convenient size containing the elements of a science, a collection of rules, or the like, . . .

The present work fails to meet this definition. It is not a book, but a series of six books, and, while each of the six volumes by itself may be "carried in the hand or conveniently handled," the complete work would call for an unusually strong hand to manipulate it. We should say, therefore, that the word "manual" appearing in the sub-title is a misnomer, and, particularly as three more volumes are to appear, would prefer to call the work a "cyclopedic treatise." It is only fair to say, however, that "manual" is widely used at the present day to designate books that are neither small or conveniently handled, and that do not in any other way comply with this definition.

On looking through the three volumes the question strongly suggests itself: Why did the author stretch the subject-matter out into the cyclopedic form, why did he not arrange it as a manual, in harmony with the sub-title adopted? At many points an unnecessary breadth of treatment seems to be noticeable, and at times, even, this is more properly characterized as prolixity. Again, certain encumbering matter is given in the body of the book in full detail, matter which should either have been omitted or, better, relegated to an appendix where in small print and compact form it would have been more serviceably located. We refer here to some 60 or 70 pages in the second volume, and a similar amount in the third volume, giving legal contract forms and specifications, respectively, for underground conduits and for furnishing and installing cable plant. The detail points of practice involved in the specifications are discussed elsewhere in the book, so that in repeating them by means of the sample specifications the author does not help the student reader. As a matter of reference it may be convenient to have such specifications on hand, but they should not be allowed to load up the explanatory and descriptive text.

As illustrating our remark about prolixity, we cannot refrain from quoting the opening paragraph of the second volume:

Stretching between the substations and the central office extends the wire plant, an enormous copper network outrivaling in intricacy and complexity the elaborate creations of the most ingenious of the geometricidæ (geometridæ). Unfortunately in the construction thereof the telephonic arachnid cannot in the least depend upon any inherited instinct like his crustaceous confrère, . . .

Which is, to put it mildly, somewhat confused zoölogically.

Sometimes, again, the author's fervor befogs his grammar, as in the following sentence from the preface to the same volume:

to telephone engineers, as conduit builders, the improved appearance of city streets owe a huge debt of gratitude.

We might possibly disagree with the author in his use of certain words, as where he employs the word "lineage," analogous to "mileage," to denote the aggregate length of line in a telephone network, regardless of the fact that the same combination of letters is already established in the language in a quite different sense and with a different pronunciation. But this is a trivial thing.

A serious matter, however, comes under our notice on pp. 47 to 51 of Vol I., where the author gives four pages of mathematical analysis that is positively ridiculous. The problem is: Given a region containing a number S of subscribers all tributary to a single central office, to find the location of office which will give the minimum aggregate of length of subscribers' lines under the condition that all lines must follow the streets, which latter form a rectangular network. The author attempts to find this location by the calculus method of maxima and minima. He begins with an incorrect equation, then gives two pages of calculus to prove that a linear function of two independent variables *can be* differentiated by successive partial differentiation, and finally by means of a totally incorrect use of partial differentials he deduces an absurd result. That is to say, if the total number of subscribers be S, this number may (arbitrarily) be divided into two parts U and V so that U +V=S; then the author "proves" by his mathematical work that U + V equals zero! He concludes from this that U = — V, and hence that the two arbitrarily assumed parts U and V are equal to each other. He thus wrongly interprets the results of his calculation as defining the proper condition (which he must have known in advance) for the desired most economical location of office.

As a matter of fact, there are two certain parts whose sum is S, which must become equal to each other to give the location of the telephonic center, but though the author does define his U and V to be these certain parts, he does not introduce the conditions into his equations. The entire array of equations, and even the method employed, is wrong and absurd. Such an error is to be regretted in any technical book, but much more when the book may find use as a students' text, in which case it is probable that many students would blindly accept the author's mathematics as a correct solution of the problem. We have here a treatise embodying a large amount of experience and practical teaching, marred by a bad error because its author "drops into" mathematics in a way that strongly reminds us of the immortal Mr. Wegg.

For the chance of a subsequent correction of this erroneous matter we venture the suggestion that a correct analytical derivation of the desired conditon is very simple; but it might equally as well be omitted, stating the conclusion as an obvious fact, and leaving such readers as entertain doubts to work out a proof for themselves. This would save at least four pages of matter. We would also suggest that, although the method of successive partial differentiation is quite inapplicable to this particular problem, it may be applied in another way to questions of office location; if, for instance, the office can for any reason not be located at the most economical point, then this method shows that it may be located at any one of a number of points with equal advantage, since there are what we may call "equal mileage" lines at different distances from the true telephonic center.

When in a previous paragraph we implied that this six-volume work might have been reduced to manual-form, we meant to convey that there is enough good and solid matter in the work to make it a valuable manual. The author is a telephone man of many years' experience, and he has collected material from all branches of telephone working which is here brought together in such an arrangement as to show the "state of the art" in each branch and to make clear how the design of telephone plant is influenced by natural conditions and practical experience. A brief summary of the contents of the first three volumes of the work is as follows.

The first volume introduces the subject by a vocabulary of the specialized words and phrases relating to telephone practice. This is followed by the important matter of where to locate the central office; upon this location the cost of the wire plant largely depends. How this latter cost is affected by the distribution of the subscribers, i. e., their relative density over the area covered, etc., is next considered, together with the effect of subdividing the territory among a number of central offices connected by exchange wires or trunks. An important factor in the cost of this arrangement is the capacity of a single trunk, which determines the number of trunks required. The consideration of this matter closes the first volume.

The wire plant of a telephone system is composed of underground lines and overhead lines. Underground wires are laid in ducts or conduits, and are always in the form of cables composed of many pairs of wires enclosed in a protecting sheath. The arrangement of the underground plant depends upon the questions of conduit construction, which latter subject, accordingly, is taken up in the second volume of this work. Conduits of all types are described and fully (often rather too fully) illustrated. Manhole construction is particularly treated. The cost of conduits is given a separate chapter, which includes many tables and diagrams for rapidly calculating the cost in a specific case. The concluding one-third of this volume is a detailed specification for conduit construction.

As stated above, underground wiring is always in the form of cables, but aerial lines are in many cases economically put in cable form. Cable work for both cases, aerial and underground, is treated in the third volume. The chapter headings for this volume are: (1) The Principles of Circuit Design, (2) Mechanical Properties, (3) Installation, (4) The Question of Electrolysis, (5) Cost of Cable Wire Plant, and (6) The Construction of Cable Plant, which latter chapter, covering about half the book, is a detailed specification for the manufacture and installation of cables and accessories.

The work as a whole can, of course, be judged completely only when the other three volumes appear. Excluding the matter of form, which as already noted is often diffuse and might well be condensed, the work seems to be practical in its treatment and quite complete, so that it should be a valuable addition to existing literature on telephony. In particular, it will constitute a good compendium of present practice and a convenient summary of the principles governing that practice. We think that the author himself takes somewhat too modest an attitude, which may act to inspire lack of confidence on the part of the reader, when he says, in his introductory chapter of the first volume:

At best these observations can only cover a small fraction of even present telephonic experience, and deductions therefrom must be accepted with the greatest caution, and be subject to extreme modifications, both in place and in time.

The mechanical equipment of the work is, on the whole good, though many of the illustrations are but second-grade. A detail point that may be criticised is the fact that on the back of each volume there is given, in addition to the general title of the work, etc., only the number of the volume, but not its general subject, though the latter appears on the front cover. This omission may mean frequent rehandling of the six books, as they stand on the book-shelf, in order to find the volume in which a particular matter is treated.

COAST AND GEODETIC SURVEY.—Report of the Superintendent, Showing the progress of the work from July 1, 1901, to June 30, 1902. Washington: Pub. Doc. Cloth; 9 × 11 ins.; pp. 799; charts.

As is usual, this report commences with the detail of office work and field operations for the year; but in the appendices we find some matters of more general interest. Among the new instruments employed is noted the hypsograph, invented by Assistant Fremont Morse. This is a circular topographic slide-rule, with the following advantages over the ordinary rectilinear slide-rule: It does not give elevations in the same unit as the distances, but gives heights in feet when the distances are measured in meters; and in determining heights the elements used are the horizontal distance and angle of elevations, instead of the inclined distance and angle of elevations. The various magnetic observatories, their instrumental equipments, and the results of observations of magnetic dip and intensity occupy very considerable space in the report. Appendix No. 7 is devoted to Hawaiian geographic names and to the pronouncing and meaning of Hawiian words. Appendix No. 8, covering over 350 pages, gives a remarkably full bibliography of geodesy, with a simple alphabetical trrangement noting authors, abbreviations and subjects. This most exhaustive compilation, gathered from all available sources, covers nearly 8,000 titles.

THE TOWER CLOCK OF THE UNIVERSITY OF CHICAGO—Chicago: The Chicago Manual Training School. Paper; 5 × 7¾ ins.; pp. 64; illustrated.

This is a paper by Mr. Earl B. Ferson, reprinted from the "American Jeweler," describing in detail the clock named, which was made by the Chicago Manual School.

Methods and Costs of Handling Earth.

EARTHWORK AND ITS COST.—By Halbert Powers Gillette, M. Am. Soc. Min. E., Associate Editor Engineering News. Cloth; 5 × 8 ins.; pp. 244; tables, folding plates and illustrations in the text. $2.

The best means of handling earth and the costs involved in such work confront most engineers and contractors sooner or later, while to many they are matters of the utmost concern. Heretofore most of the data on the subject have been scattered here and there in descriptions of individual works, or briefly summarized in engineers' pocket-books. In the volume before us the author makes available not only his own notes on the subject, but his gleanings from a careful examination of a wide range of engineering literature. The following resumé of the contents of the book will indicate somewhat of its range and character:

In the introductory chapter the author discusses the "Art of Cost Estimating," and, after quoting a number of examples to show how liable engineers are to underestimate the cost of work, 15 causes of underestimates are given. "Most of these fifteen causes of underestimates are so self-evident that to be appreciated need but to be seen," as the author states, so the discussion is confined to the one cause that has hitherto received little or no recognition. It is nevertheless a fact that quite a dissertation might have been written upon each of the remaining 14 causes of underestimates, and as this chapter should be of especial value to the young engineer it might with propriety have been lengthened.

The swelling and shrinking of earth forms the subject matter of the next chapter, and an array of experimental evidence is set forth to show the behavior of earth under varying conditions. It is interesting to note that, in one case cited, an earth embankment was found to weigh 133 lbs. per cu. ft., or almost as much as solid masonry.

The author quotes at length from the controversial letters on the subject of earth shrinkage that were published in Engineering News some three years ago, and closes the chapter with a summary of deductions drawn from a collection of apparently contradictory facts.

Earth classifications is next considered, and the stand is taken that no specification can be so drawn as to entirely avoid dispute, where mere words are depended upon to distinguish earth from hardpan or shale. The author therefore recommends the filing of samples of the various materials to be handled, and the use of these samples to decide disputes as to classification. Great stress is laid upon the economic value of test pits, not only as a means to avoid disputes as to classification, but also to enable the contractor to bid more intelligently upon the work.

The "Cost of Loosening and Shoveling," Chap. III., marks the beginning of the detailed discussion of costs that follows in the next 160 pages; and, at the close of each of the seven subsequent chapters, simple rules are given for determining the cost of earthwork by the different methods of handling. Under "picking and shoveling" we find cited the records of output given by Ancelin, Cole, Billings, Hodgson, Gillespie, Clark, Brown, Morris, Parker, and Gillette.

The author discusses not only the effect of varying the size of shovels, and the distance to which the earth is cast, but also the difference in output of men shoveling from plowed soil and men shoveling from an embankment face. This chapter, while concise, gives a comprehensive statement regarding earth handling with plow, pick and shovel, and the costs by each method.

Dumping, Spreading, Ramming, Rolling, Sprinkling, and Trimming form the subject matter of the fourth chapter. The author gives data of his own for the most part in this chapter, and among the interesting facts set forth is the one showing that the item of trimming alone costs about $140 a mile for New York state highways, which is equivalent to about 4 cts. a cu. yd. for all earth handled.

In the chapter on "Cost by Wheelbarrows and Carts," the data are first given upon which the rules are based, then follow Rules I. and II. As these rules are typical in form, we may quote one of them:

Rule I.—To find the cost per cu. yd. of picking, shoveling, and hauling average earth in wheelbarrows, multiply the wages of a laborer per hour by 1 1-6, and add ⅓ hour's wages for each 100 ft. of haul. When wages are 15 cts. per hour this rule becomes: To a fixed cost of 17½ cts. add 5 cts. for each 100 ft. hauled.

"Cost by Wagons" is next considered, the speed of teams over different kinds of roads being given, together with several examples of actual cost of large jobs handled by the author. The chapter ends with a rule for estimating costs where wagons are used.

The two chapters that follow give methods and costs of excavating and moving earth with buck scrapers, drag scrapers, and wheel scrapers, and here again the author has drawn very largely from his own experience. For comparison he gives also the output of wheelers on the Chicago Canal and on other works. The tables of cost in Trautwine's "Pocket-Book" receive severe criticism as being found on fallacious assumptions. The sizes of the different scrapers, nominal and actual, are given, together with data upon which Rules IV. to VII. are based.

The cost of handling earth with elevating graders and wagons is next given in a short chapter that closes with records kept by the author of loading wagons with a grader drawn by a traction engine. The rule that follows is the first published analysis of the cost of handling earth with these labor-saving machines whose merits and limitations are clearly set forth.

In the three chapters that follow the methods of handling steam shovels and cars are given in detail, together with a great amount of matter on costs. The methods of attacking railway and canal work are shown by means of some 20 line cuts. There is perhaps no part of the book that will be of more value than this. The author might have made it of even greater value had he discussed the handling of rock as well as of earth with steam shovels. That, however, is an addition that may well follow in future editions. The handling of cars with hoisting engines on inclines, hauling with "dinkeys," unloading flat cars with plows, the resistance of cars to traction, the cost of temporary trestles, the cost of laying light track and many other items of cost go to make three very compact chapters on a most important subject.

Chap. XIII. gives a "Table of Costs," wherein it can be seen at a glance which method is the cheapest for handling earth under any given length of haul, and the cost according to each of the eleven rules formulated by the author in preceding chapters.

We come next to the chapter on "Cost of Trenching and Pipe-Laying." Ten cases are given of actual cost of trenching for water pipe and for sewers. In addition, the cost of laying the various sizes of water pipe is given in detail, followed by costs of bracing sewer trenches. Types of trench machines are briefly discussed and examples of cost given for cases where trench machines were used. Handling earth by cableways comes also under this heading.

Hydraulic execavation is treated in a separate chapter. The cost of moving earth in sluices for filling trestles, for making dams, etc., as well as the cost of excavating placer gravel by the hydraulic "giant," and the amount of water required to move each cubic yard, in a word, all the data of hydraulic excavation are presented in condensed form. Following in natural sequence is the chapter on dredging and the cost of dredging with each of the four types of dredges. Contract prices on large and on small dredging jobs form the closing paragraph of this chapter.

"Miscellaneous Cost Data" is the title of a chapter which, as the author says, is a "scrap bag of cost information." Here are given the costs by many special methods, including the power-scraper used on the Chicago and the Massana Canals, handling earth with derricks, excavating frozen earth, handling earth with belt conveyors, puddle, etc.

One of the interesting paragraphs in this chapter is that giving the cost of excavating on the Rapid Transit Subway now being built in New York city.

The last chapter, on "Earth and Earth Structures," contains discussions of embankment building, the prevention of slips or slides, and the author's formulas for the horizontal thrust of earth. These formulas are based upon experiments, and it is shown that the curve of pressure is a parabola, and not a straight line, as has hitherto been assumed. This, the author finds, is due to the fact that the coefficient of friction of earth on earth is not a constant, but is a variable depending upon the unit pressure or head of earth.

There are three Appendices, two of which are reprints from the author's contributions to Engineering News. In the first of these appendices the endless tape level-rod is described, and a method for rapid earthwork calculation is given. In the second appendix methods of overhaul calculation are described. The last appendix contains detail drawings of a small "home-made" dredge and the cost of making it.

The book has been made in a handy form, with large clear type, and serviceable illustrations, and is provided with an index.

New Orleans Water Purification Investigations.

WATER PURIFICATION AT NEW ORLEANS and Proposed Plans for Sewerage and Water-Works Systems. New Orleans, La.; Sewerage and Water Board. Stiff paper, linen back; 6 × 9 ins.; pp. 266; 78 tables, and 27 folding and other plates.

The bulk of this volume is made up of the report of Mr. Robert Spurr Weston, Assoc. M. Am. Soc. C. E., Resident Expert on the Water Purification Investigation. A special pumping station drawing water from the Mississippi River, subsiding basins, slow and rapid or mechanical filters, and a laboratory for water analyses were put in operation on Dec. 15, 1900, and continued in service until August, 1901. Mr. Weston devotes a chapter of his report to a discussion of the composition of the Mississippi River water at New Orleans. He then describes the water purification station, the operation of the subsiding basins, the slow sand, modified slow sand, and mechanical filters, and closes with a general "resumé of the preceding chapters, with especial reference to the efficiencies and cost of operation of the various systems." He recommends the adoption of subsidence, coagulation, and mechanical filtration. The estimated cost of a 40,000,000-gallon plant is $700,000, and the aggregate cost of purification, including interest, depreciation, operating expenses, and pumping to the filters, is placed at $15 per 1,000,000 gallons. Mr. Weston's report is accompanied by numerous tables of analyses and other statistics, and is followed by a "Summary and Review of the Water Purification Question," prepared by Hering & Fuller, Consulting Engineers, of New York. Both Mr. Hering and Mr. Fuller, it may be added, were members of the advisory board of engineers, appointed by the Sewerage and Water Board.

The proposed sewerage system for New Orleans is described by Mr. W. T. Crotts, Principal Assistant Engineer. Mr. Geo. G. Earl, M. Am. Soc. C. E., General Superintendent of the Board, contributes an opening chapter reviewing the inception of the water purification investigations; also two chapters at the close of the volume, in which the proposed water-works are described, and information relating to water supply and sewerge is given.

In conclusion, it is interesting to note that about ten years before these investigations were made there was a disastrous attempt to install a mechanical filter plant at New Orleans. That was in the days when guarantees were accepted by water-works authorities in lieu of actual knowledge of what a water purification plant would accomplish. This particular guarantee saved the New Orleans Water-Works Co. from the necessity of accepting a filter plant not suited to the work in hand, but it contributed largely both to the failure of the guarantor and a temporary paralysis of mechanical filtration; and, perhaps most important of all, it did not give the people of New Orleans the pure water which they so badly needed. The investigations recorded in this volume seem to ensure a good water supply at reasonable cost. The report, though on a less extensive scale, will take its place with the well-known Louisville, Pittsburg, Cincinnati, and Washington reports, and does credit to Messrs. Earl, Weston, and Fuller, upon whom the direct responsibility for the work chiefly rested.

Some Phases of Gas and Electric Lighting.*

PUBLIC LIGHTING BY GAS AND ELECTRICITY.—By W. J. Dibdin, Formerly Chemist and Superintending Gas Examiner to the Metropolitan Board of Works and the London County Council (1882-1897). London: The Sanitary Publishing Co. Cloth; 6 × 9 ins.; pp. 528; folding and other tables, and many illustrations. $8.

The chief impression made by a reading of that portion of this book which deals with gas, is that the term "Public Lighting" either carries in England a different meaning from that which it bears in the United States, or that the title does not describe the contents. The latter is apparently the alternative that must be accepted, since several indirect definitions of the term appear in the book and show that it is understood by the author as referring to the use of illuminants by the people of a community as a whole for the lighting of streets and public places, and not, as one is led to suspect from the contents of his work, to the use by the people, as individuals, of a supply of light furnished from a central, or, as it might be called, a public plant.

A book on "Public Lighting" should treat primarily of the points that must be borne in mind in planning a satisfactory scheme of street lighting, such as, among others, the minimum amount of illumination permissible at any point and the influence upon the value of this minimum of the character of the neighborhood lighted, and of the uniformity or otherwise of the lighting of the space included between two adjacent lamps, while the various sources of light at the command of the public lighting engineer should be treated from the standpoint of their value as instruments to enable the fulfilling in the most perfect manner of the requirements shown to be necessary. Mr. Dibdin has, however, devoted all of even the small part of the gas section of his work that applies in any except the most indirect way to the subject covered by the title to a somewhat detailed description of gas lamps of widely varying candle power, without giving the slightest hint as to how any of these lamps should be used. As a treatise upon photometry and the measurement and consumption of gas, to which subjects it is chiefly devoted, the gas section is fairly valuable, although containing nothing new, but to those interested particularly in public lighting its chief value is derived from the series of tables giving particulars of the lighting systems in a number of towns in England and America. These tables show what is being done in a number of different places, even though they do not tell how satisfactory are the results obtained.

The disappointment that the book does not fulfill the expectations raised by its title is the greater because the character of the street lighting, in even our largest cities, shows that there is much to be learned, first as to what is to be sought for in such lighting, and second, as to how the desired end can be obtained in the most economical manner. The main idea seems usually to be the securing of the greatest possible amount of light for the money, without taking any thought as to the character of illumination obtained, and a book that would secure the recognition, by the proper authorities, of the fact that good illumination is the main object to be sought in public lighting, and that the total volume of light is a secondary matter, would be of great value. Such a book should come from the pen of a municipal engineer without prejudice in favor of any particular illuminant, and it would seem as if the amount of money expended for public lighting would warrant the taking up of the subject by the engineers of our large cities.

Glancing in more detail at the contents of the gas section of the book it is found that it opens with a discussion of the source and management of artificial light, after which there are few chapters on photometry and allied topics, two on the physical properties and chemical composition of gas, and two on enrichment. Meters, burners, incandescent lighting, special devices for controlling pressure and vibration, and methods of lighting and extinguishing lamps are next discussed. There are a few pages on street lighting tables and diagrams, some abstracts from Liverpool reports on the efficiency of mantles, and the cost of improved means of lighting, and finally, for the gas section, a chapter on the heating value of coal gas and calorimetry.

The part of the book dealing with electric lighting is quite as unsatisfactory as the section on gas lighting. It consists, first, of an elementary exposition of the flow of current and of the generation of electricity by induction; next the author discusses the principle of construction of electric generators and motors, both direct-current and induction, and the elementary principle of the alternating current transformer. Then there is a chapter on "Measurement of Current," in which the only item pertaining to the subject is a diagram showing a voltmeter and ammeter connected in circuit. Tacked on to this chapter, and forming about a third of it, is a description of the three-wire system. Illumination is briefly touched on in a chapter entitled "Distribution of Light;" if this is to be given anywhere in the book, it belongs with the general matter in the first part, and not in the midst of chapters on electricity.

A chapter entitled "Efficiency of Arc and Electric Incandescent Lamps" contains some measurements of Jablochkoff candles, arc, and incandescent lamps, mostly old, and some made as far back as 1879. After a chapter of five pages on the comparative "Cost and Heating Effect of Lighting by Gas and Electricity," 60 pages are devoted to descriptions of "typical installations" of English electric lighting plants, based on information "kindly supplied by the various authorities mentioned." This, combined with some folding tables giving detailed information regarding the nature and extent of both the gas and electric lighting service of a large number of British cities, is by far the most useful part of the electrical section of the book, but a good share of the descriptive matter in the text relates to the details of the machinery of the various electrical plants; for instance, it is stated that the boilers of the Gloucester works are composed of seven rings, each made from one plate 13-16-in. thick. Before concluding the electrical portion of the book, a chapter on "Acetylene" is inserted, after which "American Experience" is presented by means of a brief abstract from a report made in 1901 by the lighting committee of the city council of Cincinnati. Appendices give Board of Trade Regulations and similar information relating to electric lighting.

From the foregoing resumé of the section of this book devoted to electric lighting it is apparent that some of the matter is intrinsically worthless, and the rest has no place in a book of this kind. Of the great amount and range of information that should be given under the head of public lighting by electricity there is little to be found, and that little does not include even the most elementary description of an electric lamp. In short, nearly everything related to the immediate question of lighting by electricity seems to have been omitted. This is all the more remarkable in view of the fact that the section of the book devoted to gas contains but little on gas manufacture and distribution, but relates almost wholly to the properties and quality of gas, and its actual use for lighting, and even lighting and extinguishing the lamps.

*The section of this book which deals with gas has been reviewed by Mr. Alfred E. Forstall, M. Am. Soc. M. E., Secretary American Gas Light Association, 58 William St., New York City.

AMERICAN GAS COMPANIES.—Compiled and Corrected by E. C. Brown. New York: Press of Progressive Age. Cloth; 7 × 10 ins.; pp. 242. $5.

This well-established annual publication continues to give information relating to gas companies, their officers, finances, general equipment, volume and character of output, and prices charged for house and street lighting. Statistics relating to gas stoves are now included. Where gas companies have an electrical department, as is frequently the case, information regarding it is also given. There are sections on acetylene plants for town lighting, on natural gas companies, and parent or operating companies. The names and addresses of the officers and members of the several gas associations are given, and there is a "Technical Appendix" of a few pages on the "Transmission of Gases," "Aqueous Vapor in Carbureted Water-Gas," and other subjects. As usual, there are no summaries; not even a statement of the number of gas works is included. An improvement over previous editions is cross-references under towns with no local companies to the city or company from which they are supplied. Thus under Montclair, N. J., there is a reference to the Essex & Hudson Gas Co. of Newark, and under that company there is in turn, a list of the 17 municipalities which it supplies.

The Copper Mines of the World.

THE COPPER HAND-BOOK.—A Manual of the Copper Industry of the World. Vol. III. For the Year 1902. By Horace J. Stevens. Houghton, Mich.: Horace J. Stevens. Cloth; 6 × 9 ins.; pp. 600. $5.

The number of mines and mining companies described in this valuable hand-book is 2,207, as compared with 656 in the edition for last year. The labor of securing, sifting and selecting the great array of facts and figures found in this volume will be known only to those who have attempted to do likewise in other branches of the engineering or industrial field. That this new volume is not a mere reprint of the last edition is made quite clear by the author's statement that not more than 10% of the statistical matter contained in previous issues has been repeated verbatim.

The opening chapters treat of the history, mineralogy, geology and metallurgy of copper, and in the 50 pages devoted to these subjects a very instructive summary is presented. A separate chapter gives a glossary of some 600 mining terms that appears to be quite complete. Following this glossary are 60 pages in which a birdseye view is given of the copper deposits in the United States, by states, also the deposits of foreign countries. Then comes the body of the book in a 400-page chapter entitled "Copper Mines of the World." In this chapter the 2,207 mines are arranged in alphabetical order, and each is concisely described. The description gives the names of the officers, engineers, and managers, the capital stock of the company, the output, the dividends, if any, the character of the ore and its treatment, the development work done, the method of mining, the plant, and many other details of interest and of value. In this connection we may add that the author promises in a future edition to give much more than he has in this edition on the actual cost of mining and treating copper ores. By so doing he will make a departure that will meet with universal approval. There is much scattered information on mining costs, but a single well-written chapter on the subject would be well worth the full price of the book. We would caution the author against giving a mere mass of undigested figures. It will be far better to have fewer figures, provided they go into details, and are based upon known rates of wages, prices of fuel, and other factors. To merely say that it has cost $2 a ton to mine ore in a certain mine is of little value. The wages paid the miner, the helper, etc., the length of the working day, the number of tons mined, the fixed charges, and many other items should be ascertained and recorded.

In no other class of industrial production is it so easy to get cost data as in mining, for it is not a part of the mining company's stock in trade. The manufacturer of cotton fabrics does not care to make public the cost of production, for it might stimulate competition. The mining manager has no such fear, in most cases, for his mine cannot be duplicated, as can a manufacturing plant. We sincerely hope that this handbook of copper mining, already so admirably conceived and written, will in future editions contain a comprehensive chapter on costs of copper mining.

Following the section on the mines of the world is a chapter of copper statistics, giving production by years, monthly prices since 1860, production and dividends of the largest mines, and many other useful tables.

The author may well take pride in the work he has done, for it will be of inestimable aid to mining engineers and mining men seeking a ready answer to questions pertaining to the copper mines of the world.

Lectures on Our Solar System.

THE SOLAR SYSTEM.—Six Lectures Delivered at the Massachusetts Institute of Technology in December, 1902. By Percival Lowell, Non-Resident Professor of Astronomy at the Massachusetts Institute of Technology, and Director of the Lowell Observatory, Flagstaff, Ariz. Boston and New York: Houghton, Mifflin & Co. Cloth; 5 × 8 ins.; pp. 134; tables, diagrams, and plates. $1.25 net; by mail, $1.33.

In these six lectures upon our solar system Professor Lowell points out the great advance made by astronomers in the last twenty-five years, as the result of working with new and better instruments, and especially with more personal intelligence, care and knowledge. In the first place, we now know that, excepting only the fixed stars and the nebulæ, every heavenly body we see belongs to our solar system and is controlled by our Sun. This control includes comets, shooting-stars and the mysterious meteorites, ærolites, or bolides that we formerly believed were bits of some stray body from interstellar space and foreign to our system. Professor Lowell tells us that while these really come to us from the Sun's own domain, their orbits conclusively prove that they cannot come from our present Sun, but that they must have originated in the Sun that our system had before the catastrophe occurred which caused the nebulæ which caused our Sun. Meteorites and their kind thus antedate what the nebular hypothesis classes as the beginning of things; they are old with an age that staggers the imagination; older by cycles of evolution than anything we see in our firmament; and in their presence the evolving of our solar system itself is a modern event. In outward fused condition these visitors simply bear the evidence of the last stages of their journey through our atmosphere; but iron meteorites are saturated with occluded gases which could only have penetrated originally under such conditions of intense heat and excessive pressure as are only present in the interior of a Sun. These gases can be extracted by suitable processes and released after an imprisonment of unthinkable cycles.

In speaking of the vast orbit of comets, Professor Lowell shows that there is abundant room in the Sun's domain. Our Earth is distant 93,000,000 miles from the Sun; but 275,000 times this distance measures the space between our Sun and the next nearest sun—the star α in Centauri. Neptune, the farthermost known planet in our system from our Sun is only 30 astronomical units from it; or its distance from the Sun represents only the 1-4,000 of the distance limiting the Sun's domain. Relatively, then, our whole planetary system nestles closely to its Sun, and there is space beyond for all the erratic movements of the smaller bodies. In noting the single-sun system as the general family trait which distinguishes our solar system from many that lie about it, Professor Lowell assumes that the stars are centers of systems of their own; and he remarks that while celestial mechanics as applied to our own system appear very abstruse, they are but child's play compared to the complications which two, three, or four Suns would introduce into a system over which they jointly hold sway.

The six lectures are respectively devoted to: Our Solar System, Mercury, Mars, Saturn and its system, Jupiter and his comets, and Cosmogony. As indicated by our brief comments on parts of the first lecture, the subject is treated in an exceedingly interesting manner, and from the standpoint of the latest knowledge.

To add one more note, the lecture upon Mars and its canals is a fascinating one. The lecturer confines himself to mechanical principles and especially warns his hearers against allowing their imagination to soar unballasted by fact. But after summing up the present knowledge of surface conditions on that planet, he concludes that the canals are artificial and therefore imply organic intelligent life upon Mars. But life on Mars, the author states, owing to atmospheric and other conditions, must take on a very different guise from that it wears on Earth. Man as we know him cannot exist there; but this does not preclude a local intelligence equal to, and perhaps easily superior to, our own. Whatever exists there in the form of intelligent organic life has made an imprint far exceeding anything we have left upon Mother Earth. While the artificial character of the canals on Mars is still denied by some astronomers, the conclusions drawn in this lecture are logical and are based upon a clear and convincing array of conditions found.

For those who care to enter into the celestial mechanics of a single-sun system there is sufficient detail and an abundance of mathematics and guiding diagrams; but this part is so arranged that it may be omitted by the more general reader.

Some Phases of Highway Construction in Wisconsin and Elsewhere.

HIGHWAY CONSTRUCTION IN WISCONSIN.—By Ernest Robertson Buckley, Ph. D., State Geologist of Missouri; Formerly Assistant Superintendent of the Wisconsin Geological and Natural History Survey. Bulletin No. 10, of the Survey. Madison, Wis.: Pub. Doc. Cloth; 6 × 9 ins.; pp. 339; tables, and 106 folding and other plates.

The title of this report is somewhat misleading, for country highways are not discussed at all. The author confines himself to a consideration of village and city street pavements, and the materials best suited for such paving in Wisconsin.

The first four chapters of this "bulletin" are wholly superfluous. Not only is there a waste of words in these 120 pages, but we find many inaccuracies, and many generalizations that to the novice will be quite misleading. Of the inaccuracies perhaps the most striking are the coefficients of heat expansion of marble, granite and sandstone, given on page 5. The expansions are given in fractions of an inch per foot where they should read in fractions of a foot per foot. The author adds that he has been unable to find records of the coefficients of expansion of cement, brick, wood or asphalt, and that they have not been determined to his knowledge. In an article on the "Cause of Masonry Disintegration," by H. P. Gillette, in our issue of Oct. 23, 1902, will be found a list of coefficients of heat expansion of stone, brick, cement and concrete. In Merrill's "Stones for Building (reviewed elsewhere in this issue) and Decoration" will also be found a few coefficients not given by Mr. Gillette.

Among the author's generalizations to which exception may well be taken we select the following:

(1) The highway should be paved from gutter to gutter.

Why? In Medina, N. Y., in Montclair, N. J., and in many other towns are to be found macadam pavements occupying only 16 or 18 ft. of the center of streets that are 30 ft. wide or more between curbs. And very often there are no curbs or paved gutters of any kind in those streets.

(2) The introduction of 5 or 6 ins. of sand and gravel to serve as a foundation on a street which has a clayey or mucky subsoil can hardly be expected to prove altogether satisfactory.

Why not? In the last annual report of the Massachusetts Highway Commission we find gravel recommended as a foundation on soft soils in place of telford. On the clay soil near Buffalo the State of New York has built macadam roads on gravel foundations that are satisfactory; whereas 6 ins. of macadam laid directly upon that clay has been found insufficient. Other instances might readily be cited.

(3) Brick foundation has been abandoned except in special cases.

Here the author speaks of brick laid flatwise as a foundation for the wearing coat of brick on edge. That brick foundations have not yet been "abandoned except in special cases" may be learned by consulting the Report (1902) of the Paving Brick Committee of the Iowa Engineering Society.

(4) No cement should be accepted that is not shipped in barrels.

Why not? Most of the cement used for pavement foundations is shipped in bags, and doubtless will continue to be so shipped.

(5) Concrete should be made out of seven parts of broken stone to five parts of cement mortar by volume. The mortar should consist of one part by volume of cement and four of clear, coarse, sharp sand, limestone, granite or quartzite screenings.

This is assuredly a remarkable specification. The author adds that "the whole mass should be mixed by turning with shovels and *rakes*." (The italics are ours.) After the concrete is laid and rammed "it should be covered with a dressing of grout one-half inch in thickness, consisting of one part of cement and four parts of sand." Why?

(6) In the telford pavement the foundation consists of large fragments of stone laid on edge, lengthwise of the street, with the broadest side down.

Laying telford lengthwise of the street is new to us. The author adds that the thickness of telford foundation "ordinarily does not exceed 6 ins." In fact it seldom is less than 6 ins.; generally more.

(7) Upon this surface should be spread, evenly, a third course of fain screenings which should be watered and rolled as before.

Why? What is the objection to *fat* screenings?

(8) It is expected that the top dressing of 2 or 3 ins. will eventually wear away . . . (then) the pavement should be redressed with granite or other screenings.

The author evidently confuses "screenings" with small broken stone bound with screenings.

(9) Attempts have been made to render wooden blocks impervious by a process called creosoting.

Creosote is used to prevent the growth of the fungi of decay—not to exclude water. Cedar is quite pervious, but the oil of cedar in the wood does not make palatable food for rot fungi.

(10) The practice of troweling the surface [of cement sidewalks], which has been so common, should be stopped. [Why?] Brooming the surface of the walk gives it a roughness which is very desirable. . . . The public may object to this method of construction on the ground that the roughness of the surface has a tendency to wear out shoes. However, the municipal authorities must expect that the public will complain either that the pavement is too slippery or too rough.

In the ten examples, above given, of questionable generalizations we have made no attempt to cover the whole field of the 120 pages on engineering practice in highway construction.

Coming to the fifth and sixth chapters we are glad to be able to say that the author is on more familiar ground, where he can do justice to the subject and to himself. Here we find 177 pages largely devoted to a detailed study of the pavements and pavement materials of all the cities and villages of Wisconsin. The author's frequent advice to use macadam on residential streets is sound, and we doubt not that the particular kinds of stone recommended are the best, durability and cost considered.

The author has mapped every city and many of the villages of Wisconsin, and the maps show in colors the kind of pavements laid and their extent. Tables are also given of the width, thickness and date of construction of these pavements, and of contract prices. All such statistical matter is of unquestionable value. Many interesting photographs of pavements are also shown.

Where the author has confined himself to geological and descriptive work he has made few errors. But in attempting to write a sort of manual on pavements he appears to have relied too much on the opinions of others and has not always compiled with good judgment.

While the foregoing review was being written a letter criticising the bulletin was received from Mr. Logan Waller Page, Chief of the Road Material Laboratory of the U. S. Department of Agriculture, Washington, D. C. It will be found in this issue under "Correspondence."

SURVEY OF NORTHERN AND NORTHWESTERN LAKES.—Bulletin No. 13. To Supplement the Information Given Upon the Charts of the Great Lakes, and Issued with those Charts from the Office of the U. S. Lake Survey, Detroit, Mich. Stiff paper; 8 × 10 ins.; pp. 304; maps.

This bulletin describes the harbors and navigation routes of the Great Lakes, and also improvements thereto in progress or projected. Regulations for the various harbors and rivers are also given. The bulletin is dated April 15, 1903, and already a supplement to it has been issued. Copies of the bulletins and supplements may be obtained by applying to the Survey, as above, or to the various U. S. Engineer Offices located on the Great Lakes. W. L. Fisk, Major, Corps of Engineers, U. S. Army, is in charge of the U. S. Lake Survey.

A Dictionary for Car Builders.

THE CAR BUILDERS' DICTIONARY.—An Illustrated Vocabulary of Terms Which Designate American Railroad Cars, Their Parts, Attachments and Details of Construction. Compiled for the Master Car Builders' Association by Rodney Hitt, B. M. E., assisted by A. M. Waitt, Late Superintendent of Motive Power, N. Y. C. & H. R. R. R.; J. S. Lentz, Master Car Builder, Lehigh Valley R. R.; and W. P. Appleyard, Master Car Builder, N. Y., N. H. & H. R. R. New York: The Railroad Gazette. Leather; 9 x 12 ins.; pp. 525; 4,971 illustrations. $5.

This dictionary had its inception in 1872, when the Master Car Builders' Association appointed a committee "with power to publish an illustrated book, defining the proper terms or names of each and every part used in the construction of railway cars, and a description of the use of the same. Eight years later, or in 1880, the committee submitted the first edition of the Dictionary. The latest revision prior to the present one was completed in 1895. This one was authorized by the Association last year. Besides bringing up to date the matter previously published a section on car-shop machinery has been added. The aim of the work is to show current practice, including, of course, all the standards of the Master Car Builders' Association. The practical nature of the revision is partly indicated by the fact that this edition contains 712 less illustrations than the one for 1895, which appears to have been accomplished by rejecting illustrations of material rapidly going out of use, and excluding duplicates. An important aid in reducing the illustrations has been the recent advances in standardization.

The volume is divided into two parts: (1) Definitions, with but few illustrations; (2) illustrations. This may seem awkward, but as the space occupied by the illustrations is 2½ times as great as that taken up by the definitions it will be seen that any other plan would have been difficult and would also have had disadvantages.

The illustrations include numerous figured detailed drawings, diagrams showing names and relations of parts, half tones, and reproductions from the catalogues of manufacturers.

So standard a publication needs no words of praise, further than to say that its usefulness has been increased by the revision, and that it would be well if other branches of industry and engineering had dictionaries of equal merit.

LONDON STATISTICS.—Statistics Printed by the London County Council During the Year 1901-2, with an Analysis of the Statistics Relating to London Printed in the Annual Reports of the Local Authorities for the Year 1900-1, and in Parliamentary Papers of Session 1901. Vol. XII. London: The County Council. Paper; 8 x 13 ins.; pp. cxxviii., 444; tables, maps, and diagrams. $2.

The statistical publications of foreign cities, valuable as some of them may be, are frequently notable for the delay in their publication. This volume of "London Statistics" contains the welcome announcement that hereafter the County Council will issue this publication regularly, without waiting for belated returns from the various boards and local authorities. It is expected that Vol. XIII, containing statistics published within the year ending March 31, 1903, will be issued about the middle of this year.

The volume before us is in two parts. The first, called "Memorandum,"

classifies the various branches of statistical information relating to London, whether printed in this volume or not, and compares them with the corresponding statistics of previous years. It also brings into prominence any important conclusions which may be forthcoming under any given head, and indicates where fresh information is needed.

The main divisions of the "Memorandum" are statistics relating to: (1) The life of the people, including population and houses, health, labor, education and other topics; (2) public services, such as streets, housing the working classes, gas, electricity and water supply, and fires and fire insurance; (3) finance, including valuations, taxations, receipts and expenditures, and debts; (4) local government of London, embracing administrative areas and the franchise; (5) statistical comparisons between London and the rest of England.

The Memorandum is made up of both statistics and text, but the second part of the volume consists of statistics only. Many of these are in much detail, by local divisions. They are on valuation and taxation, sickness and death, gas testing, bridges, tramways, and various other subjects, many of which have been mentioned in describing the first part of the volume.

Building Stones.

STONES FOR BUILDING AND DECORATION.—By George P. Merrill, Curator of Geology in the U. S. National Museum, and Professor of Geology in Columbian University. Third Edition, Revised and Enlarged. New York: John Wiley & Sons. Cloth; 6 x 9 ins.; pp. 540; tables, 22 plates, and 24 figures in the text. $5.

The first edition of this excellent work was reviewed at length in our issue of Sept. 26, 1891. The book is now larger than the first edition by some 85 pages, and five maps showing the distribution of the more important building stones have been added.

In Part I. (pp. 43) are discussed the geographical distribution of building stones, their physical and chemical properties, rock classification, and the geological record. Part II. forms the body of the book, and within its 335 pages are described in detail the various kinds of stones, and their occurrence in the different states of this country. The arrangement of the states alphabetically makes reference easy, and is therefore commendable. While this section is of some value to engineers it is more particularly serviceable for architects, but Part III. and the Appendices are of interest to all. Part III. in its 116 pages treats of the weathering and disintegration of stone and methods of preservation, stone quarrying and dressing, and stone testing. By all odds the best chapter of this part is the one relating to stone weathering, although, with the exception of the chapter on quarrying and dressing, the other chapters are excellent. Quarrying, however, is described only in a superficial way, and there are no data of much value either on quarrying or dressing stone.

One of the appendices treats very briefly of the cost of stone dressing, but, as the author does not give the rate of wages received by stone cutters, the data are of very little use.

An eleven-page table of the strength, specific gravity, and absorptive power of stones possesses value, as does also a nine-page table of the chemical composition of stones. Both of these tables are in Appendix I. In another appendix is given a long list of important stone structures in the United States, with dates of erection and material used. Then follow a bibliography of works on building stone and a short glossary of terms.

A book of this size and character should have an index, but this book has not.

HARTFORD MUNICIPAL INFORMATION.—For Business Men, City Officials, Professional Men, Property-Owners and Tenants. Hartford, Conn.: Frederick L. Ford. Paper; 4 x 7 ins.; pp. 262. 25 cts.

It would be well if similar books of municipal information were published for or by each city in the country. This handy little volume gives in convenient form a wide range of information about city departments and services which any householder is liable to want almost any day in the year. Methods of procedure for getting a street improved or for obtaining a meter from the gas company are two of many illustrations of the usefulness of the book. Two interesting tables contain valuable information regarding the pavements and the sewers on many streets. The tables include unit costs and assessments per front foot levied against property owners.

A NEW SYSTEM OF REWARDING MACHINE-SHOP LABOR.—The Latest Advance in the Art of Shop Management. By H. L. Gantt. Reprinted from the Machine-Shop Number of Cassier's Magazine. New York: The Cassier Magazine Co. Paper; 6 x 9 ins.; pp. 11; tables and illustrations. 10 cts.

The bonus system, as here described, has for its object an increased output from a given machine, in the financial advantages of which the workman has a share. The success of the system depends very largely upon having the various stages of the work carefully planned in advance by a competent man, and issuing a combined instruction and time card with each job. The author states that he devised the system, and that it was introduced, under his direction, in the large machine shop of the Bethlehem Steel Co. The system was fully described by the author in a paper read before the American Society of Mechanical Engineers in December, 1901, and a comprehensive abstract of it was published in Engineering News for Dec. 12, 1901.

TABLES FOR THE FLOW OF WATER THROUGH WOOD PIPE.—By J. B. Lippincott, M. Am. Soc. C. E., and D. J. Macpherson. Los Angeles, Cal.: The National Wood Pipe Co. Paper; pp. 36 to 83, of trade catalogue; 5 x 8 ins.

These tables are for well-constructed wood pipe, with planed interior surfaces, no sharp bends and with the lines always below the hydraulic grade. The authors, before preparing these tables assembled all the known data in the form of absolute determinations of flow through wood pipe. No exact measurements for small wood pipe were found. The tables are based on Kutter's formula, "but with varying values for the coefficient n." The tables are believed to be within 5% of accuracy. The diameters covered range from 3 to 120 ins., and there are given: Friction head, velocity, discharge in both cubic feet per second and miner's inches, and velocity and entrance head. The miner's inch here used is 1-50 cu. ft. per sec., or nearly nine gallons per minute. The range for each diameter is by friction head for friction in 1,000 ft. of pipe by tenths from 0.1 to 1 ft., then for 1.5 ft., then by increments of one to 10 ft. and of two to 20 ft. There are also tables of friction head, only, per 1,000 ft. and per mile; of pressure of water in pounds for each foot of increase from 1 to 300 ft.; and a brief weir measurement table.

IRRIGATION INVESTIGATIONS IN UTAH.—Report Made Under the Direction of Elwood Mead, Chief of Irrigation Investigations, Assisted by R. P. Teele, A. P. Stover, A. F. Doremus, J. D. Stannard, Frank Adams, and G. L. Swendsen. Washington: U. S. Department of Agriculture. Cloth; 10 x 12 ins.; pp. 330; 19 plates and two figures in the text.

This is a companion volume to the report on "Irrigation Investigations in California," published some months ago, and, like it, deals with water rights, litigation and the appropriation and use of water, rather than engineering problems and results. Mr. Teele opens the report with a "General Discussion of Irrigation in Utah," which includes an analysis of the new irrigation law of 1903. Irrigation in the principal or most typical drainage areas of the State is discussed as follows: Utah Lake, Mr. Stover; Spanish Fork River, Mr. Doremus; and Weber Valley, Mr. Stannard. Agriculture under irrigation in the basin of the Virgin River, and court adjudications of water rights on the Sevier River, are reported on by Mr. Adams. Finally, Mr. Swendsen takes up the appropriation of water from the Logan River. Co-operative canal companies have been and are a marked feature of irrigation in Utah, and as this fact has been kept in mind by the various investigators the report as a whole contains much interesting matter bearing on that subject. Co-operation, it may be added, is essential to the highest irrigation development.

THE STREAM CONTEST ALONG THE BLUE RIDGE.—By W. M. Davis, Professor in Harvard University. Bulletin of the Geographical Society of Philadelphia, for April, 1903. Philadelphia: The Society. Paper; 6 x 9 ins.; pp. 213 to 244; four plates.

This is a discussion of the way in which the streams flowing to the Atlantic Ocean are encroaching upon and gaining the drainage areas of the streams flowing to the Mississippi River and the Gulf of Mexico. It presents little definite information, and is somewhat technical, but it is interesting.

RHODE ISLAND COMMISSIONER OF DAMS AND RESERVOIRS.—Report for 1902. Walter C. Simmons, Commissioner. Providence: Pub. Doc. Paper; 6 x 9 ins.; pp. 46; 40 folding and other plates.

The State of Rhode Island is unique in having maintained, for many years, official supervision of the dams within its boundaries. This report, like previous ones, describes accidents to and changes in old dams, and includes descriptions of new structures. A number of large scale drawings are reproduced. These include plans, sections, elevations, and some minor details. The present report also contains some half-tone views.

Gas and Oil Engines.

GAS AND PETROLEUM ENGINES.—A Manual for Students and Engineers. By William Robinson, M. Inst. C. E., M. Inst. Mech. E., etc., Professor of Mechanical Engineering and Electrical Engineering in the University College, Nottingham, England. Cloth; 6 × 9 ins.; pp. 942; tables; 474 illustrations.

This rewritten edition of a standard British work is essentially a summary of the historical development and present "state of the art" of gas and oil engines, including among gas engines also the hot-air engine. About half of the work is devoted to this summary, which we consider to be the feature of prime value of this work. Second in importance is a long discussion of fuels, followed by a chapter on the production of gas from solid and liquid fuels. In this last portion a large variety of gas producers is described. Just as the chapters in which gas and oil engines are described include reports of many tests on such engines, so do the chapters on fuels and on gas producers include many tests and analyses of coal, oil and gas. Thus the work contains a great aggregate amount of statistical matter; so much, in fact, that its proper sorting and arrangement has often been lost sight of.

The other matter included seems to be of small importance, and in some cases of doubtful suitability for a work of this kind. In the first volume there is a chapter on elementary calculations in Mechanics and Heat, including an exposition of the indicator diagram and a full description of various forms of indicator. All this matter the student who takes up the study of gas engines will have previously encountered and mastered; and, since only a small part of it is of special application to the gas engine, any full presentation of it seems unnecessary. Similarly, some seventy pages at the beginning of the second volume are more or less superfluous; there is a chapter on "Energy," introducing a chapter on "Thermometry," or rather high-temperature measurements, and a chapter on "Combustion," where a number of forms of calorimeter are described. The last hundred pages of this volume revert to the thermodynamic of gases and to indicator diagrams, but include also an appropriate though very short chapter on "Testing of Gas and Oil Engines."

The entire work contains nothing in the way of a practical study of gas engine details or a discussion of gas engine design. Its principal value lies, as we have already expressed, in the detailed review of the historical development of gas and oil engines, and a survey of the present-day gas engine field. This part of the work is illustrated with drawings and views in especial profusion. It is to be remarked, however, that the very recent advances in the building of large gas engines to work with blast furnace gas are but indifferently represented; and the same may be said as regards automobile engines. In connection with the question of arrangement of the subject matter, no good reasons appear why the historical and descriptive matter on gas engines in general is in the first volume, while that on oil engines is relegated to the second volume. There is no special line of demarcation between the two fields of gas engine working, and in historical development, certainly, gas and oil engines can hardly be considered apart.

COMMERCIAL, ECONOMIC AND POLITICAL QUESTIONS Not Decided in the Northern Securities Case.—By Joseph Nimmo, Jr., LL.D. Washington, D. C.: The Darby Printing Co. Paper; 6 × 9 ins.; pp. 38.

This paper has as a theme a statement in the decision in the Northern Securities suit to the effect that the case involved questions of public right and policy which Congress, and not the courts, must determine. Further than affording a starting point, the Northern Securities case does not appear to come into the discussion. After a brief historical review of railway management and legislation, and court decisions bearing thereon, the author expresses the opinion that Congress should institute an exhaustive investigation of the whole subject of governmental attempts to restrain competition. The publishers state that this essay will form a portion of a work on the American Railroad System, now being prepared by Mr. Nimmo.

Biography of Rear-Admiral Philip.

LIFE AND ADVENTURES OF "JACK" PHILIP, REAR-ADMIRAL, U.S.N.—By Edgar Stanton Maclay, A.M.; assisted by Barrett Philip; with contributory and anecdotal articles by the late President William McKinley, Capt. A. T. Mahan, Rear-Admirals W. T. Sampson, G. B. Balch, F. J. Higginson, H. C. Taylor and F. T. Bowles, ex-Secretary of the Navy John D. Long, and Various Officers of the U. S. Navy. Published by The Illustrated Navy, 13 Astor Place, New York, in four numbers for May, June, July and August, 1903. 7 × 10 ins.; illustrated. $1.00 for the four numbers.

In his single, life-long devotion to duty, in his ability as a sailor, in his courageous conduct in battle, and in his Christian charity to a conquered foe—as shown at Santiago—Rear Admiral John Woodward Philip was the ideal type of an officer of the United States Navy. And his "Life and Adventures," as here set forth by loving hands, has for its expressed purpose that of providing a standard of naval excellence for the emulation of the younger officers of the American navy.

Admiral Philip, who entered the navy as a midshipman in 1856, was a man of strongly marked personality; and Captain Mahan sounds the keynote of his character when he says that his heart was in the service, and nowhere else. While all respected the officer, his cheery nature, his strong sense of humor, and his readiness to help others endeared him to everyone; and he was "Jack" Philip to his fellow officers. The life record here published is made up from his own diaries, and from articles contributed by his sister and by those closely associated with him in his professional career. These experiences commence with service in the West Gulf blockading squadron, in the James River fleet, and in the operations connected with the siege of Charleston, during the Civil War; they cover gallant service in the Chinese seas, and in other parts of the world, and culminate in the crowning glory of the battle of Santiago, where Philip not only bravely handled his ship, but was led by his deep inner spirit of compassion and charity to stop the cheering of his own men in their hour of victory by his now famous phrase: "Don't cheer, men; those poor fellows are dying." His own diary has much to do with the ordinary routine of the sailor's life; but it is so well seasoned with the natural humor of its author in his passing comments on men and events that it is very readable all the way through. The reproductions of old photographs of officers and groups of officers, of ships and of scenery, which illustrate the work, are in themselves now historically most interesting. The "Life and Adventures of Jack Philip" is a good book—not only for the guidance of the young naval officer, but also for the instruction of every young citizen of our growing country.

GROWTH AND DENSITY OF POPULATION OF GREAT CITIES.—By E. L. Corthell, Sc. D. A Paper Read Before the American Association for the Advancement of Science, Washington, D. C., January, 1903. Address the Author, 1 Broadway, New York city. Paper; 6 × 9 ins.; pp. 16; tables and double-page diagram.

This is a revision and extension of a paper with a similar title, presented by Mr. Corthell before the same association in 1895. The original paper was reprinted in Engineering News of Nov. 7, 1895. Cities of the world with a population of over 1,000,000 are included. The diagram shows population curves for many decades, and also the maximum and the average density of population for each city. In several instances the populations for the urban center, instead of the political area, are given. On this basis the estimated populations of the several cities and urban centers will have reached the following figures in 1920: London, 8,516,000; New York, 6,191,000; Paris, 4,760,000; Berlin, 3,323,000; Chicago, 3,475,000; Philadelphia, 2,203,000; St. Petersburg, 1,500,000.

The author does not state just what constitutes his "Greater New York," but says in the text that he has in mind an urban center embracing portions of New Jersey. The U. S. census of 1900 gives the population of New York as 3,437,202; Newark, 246,070; Jersey City, 206,403; making a total of 3,899,705, but Mr. Corthell's figures for Greater New York in 1900 are only 3,833,999. Certainly the 47,931 inhabitants of Yonkers, the 59,364 of Hoboken, and the 32,722 of Bayonne, to say nothing of several scores of smaller suburban communities, belong in the urban center of New York. These three alone, with Newark and Jersey City, would swell this enlarged Greater New York to over 4,000,000 inhabitants. Mention may also be made of the fact that in discussing the maximum density of population census figures of 1890 are retained, with no statement as to whether there was no change in the locality showing the greatest crowding, and in the population per square mile, from 1890 to 1900. The London latest populations are for 1900, instead of being taken from the British census of 1901. While these may be considered as minor matters, the value of the paper would have been increased by a more thorough revision, and by more detailed statements regarding the political areas included in each urban center.

LEGISLATION IN 1902.—Comparative Summary and Index of Legislation, Oct. 1, 1901, to Oct. 1, 1902; also, Review of Legislation. Edited by Robt. H. Whitten, Sociology Librarian, New York State Library. Albany, N. Y.: University of the State of New York. Paper; 6 × 9 ins.; pp. 278 and 210. 2 vols. 50 and 25 cts., respectively.

The first of these volumes gives brief abstracts, with proper references, of the statutes enacted by the various commonwealths of the United States during the year covered. These abstracts are classified by subjects, such as public health and safety, banking, and local government. The second volume consists of topical reviews of the legislation of the year, designed to bring out salient features, only. These reviews are written by specialists. "Health" is treated by Dr. Charles V. Chapin; "Irrigation," by Elwood Mead; "Transportation," by B. H. Meyer; "Municipal Functions," by John A. Fairlie. The "Index" has been issued for a number of years. The "Review," in separate form, with assignments to numerous specialists, is comparatively new. The volumes are great time-savers for any one who has occasion to study comparative legislation, or to post himself on special topics.

THE STATISTICAL YEAR-BOOK OF CANADA FOR 1902.—George Johnson, Statistician. Ottawa: Canadian Department of Agriculture. Paper; 6 × 9 ins.; pp. 729; many tables.

A mass of interesting information and of valuable statistics is given in this volume. A large folding table presents an admirable statistical summary of the Dominion, by years, from 1867 to 1902. The history of Canada and various facts relating to the country are given in brief, and the varied interests of the Dominion are shown by numerous statistical tables. There is an analysis and abstract of the Canadian Census of 1901, and statistics on railways, commerce, mineral production, and both state and private finance.

ANALYTICAL AND TOPICAL INDEX to the Reports of the Chief of Engineers and Officers of the Corps of Engineers, United States Army, 1866-1900. Vols. I. and II., River and Harbor Works. Vol. III., Fortifications, Bridges, Laws, Miscellaneous, and Topical Index. Compiled under the direction of Lieut. Col. C. W. Raymond, Corps of Engineers, U. S. A., by John McClure. Washington: Pub. Doc. Cloth; 6 × 9 ins.; pp. 1788.

This index will be welcomed by all who are in the habit of using the reports of the U. S. Engineers, and may unlock those otherwise almost inaccessible stores of information to many others. It is so compiled as to indicate, briefly, the history of any piece of work, and to give at the same time some idea of its nature and extent. Besides the index of works, there is a general, topical index under such heads as abutments, breakwaters, guns, rainfall, and wing dams.

MASSACHUSETTS RAILROAD COMMISSIONERS.—Report for the year 1903. Boston: Pub. Doc. Cloth; 6 × 9 ins.; pp. 305; tables and folding maps.

Before proceeding with the statistical returns of steam and street railways, and the summaries therefore, there is given an interesting general discussion of the low fares for Boston suburban traffic, the impracticability of distinctly workingmen's trains in and about Boston, and the electrical equipment, as contrasted with the steam equipment of railroads. Of 45 railroad companies whose lines are located wholly or in part in Massachusetts, only ten are operating companies, and two of the ten are not incorporated in Massachusetts.

The City Made Beautiful for All Its People.

MODERN CIVIC ART.—Or the City Made Beautiful. By Charles Mulford Robinson, New York: G. P. Putnam's Sons. Cloth; 6 × 9 ins.; pp. 381. $2.50 net; by mail, $2.70.

In his previous book on "The Improvement of Towns and Cities; or The Practical Basis of Civic Esthetics," Mr. Robinson established a claim upon the attention of those concerned with the higher ideals of municipal life. In the present volume certain reforms discussed in the earlier work are assumed to have been effected, or their need at least acknowledged, thus leaving the author free to take up in a systematic way what he terms modern civic art. Thus he says in his opening chapter, entitled "A New Day for Cities."

> Observe how much the modern city is indebted not merely for comfort but for dignity and beauty to recent discovery and invention. The dark streets through which the pedestrian formerly made at night an uncertain way, with his individual lantern, now glow at midnight as at noon. The refuse once poured from upper windows to the streets, in proudest capitals, flows now in subterranean streams, unknown. The pavement, that at best in other days was a racking way of cobblestones, is now made hard and smooth. Streets, once so crowded by enclosing city walls as even in capitals of empires to be narrow, treeless slits between the buildings, now—alike in the humblest and most thronged communities—widen broadly, permitting the traffic to move with ease, and still leave room for grass and trees, and ever and again for flowers. Water is had in abundance to clean the pavements and lay the dust. The mesh of wires that inventions brought with them as a temporary urban evil are now assembling in orderly strands beneath the ground; and there is promise that the smoke, which has hung in a dark cloud above the modern industrial community, is shortly to be dissipated by the ingenuity at work upon the problem.

What then is this civic art for which the way has been or is being made clear? The author replies:

> It is municipal first of all. If men seek it they seek it not for art's sake, but for the city's; they are first citizens and then, in their own way, artists, and artists in this way only because they are citizens. We do not find men and women banding themselves together to create a public sentiment and fund in order that some sculptor may do a noble bit of work to the glorifying of his field of art. But they so band themselves and so commission sculptors, painters, artists, and landscape designers, for the glorifying of civic art—not just because it is art, but because it is civic. They are not asking the town to help art, but art to help the town; the artists not to glorify their art, but by their art to glorify the city.

This being so, civic art may be still further defined

> as the taking in just the right way of those steps necessary or proper for the comfort of the citizens—or the doing of the necessary or proper thing in the right way.

To this end beauty must be joined with utility, for cities "are not made to be looked at, but to be lived in." The fundamental art principles involved are "unity, variety and harmony." The esthetic test

> is a more rigorous requirement with civic art than it is with any other, for municipal art cannot stand alone, to be judged without its environment—and the field in which it stands is so broad to have unity, so varied to have harmony, so much the same in parts to have variety. Consider how easily civic art may fail with this test applied; a thrilling statue on an unkempt street is not successful civic art, because its surroundings are not harmonious; a park, lovely in itself, may fail, from this broad standpoint, for want of that unity in the city plan which would lend to its location seeming inevitableness. Building restrictions designed to insure harmony, but made too severe, may lose their artistic effectiveness by the repression of variety to the verge of monotony. But if it is easy to fail, as surely it is, success is better worth the winning; and where a city, or part of a city, is built up from the ground plan to the street furnishings and construction with regard for these three principles of art, how beautiful, consistent, and intellectually satisfying is the result!
>
> The desirability of obtaining such a thorough, general, and artistic plan of improvement for every community is evident. The chance to plan a city on paper before it is built comes but rarely nowadays, and the best we can do is to see to it that the cities grow artistically, and that their extensions are beautiful, and that every change in the city itself shall bring it one step nearer to the ideal. The trouble with most improvement effort is that it is planned all by itself, that the benefit to the neighborhood is studied rather than to the community, and that the first half dozen years after the improvement is made stand out with more prominence and importance—receive more consideration from taxpayers and tax spenders—than all the years that are to come thereafter. But in wise city-building we would consider not five years, nor ten years, but posterity. And to do this would be cheaper in the end.

A plan once secured which will combine utility and beauty will stimulate the public to exertion for its fulfilment.

Having defined his subject, and laid down the general principles and methods to be followed, the author passes on to the "City's Focal Points," considering in detail both water and land approaches, and the administrative center of the city. This affords an opportunity to discuss water fronts, bridges, railway stations, and city buildings, with more or less about such adornments as sculpture, trees, grass plots and other landscape effects.

The business and residential sections are next taken up. Each is separately treated as to street plan, and the character of the avenues and streets. The architecture and street furnishings of the business section are also taken up, and there is a chapter on "Adorning with Fountains and Sculpture." Minor residential streets and the tenement districts are considered in their proper place.

The final section is devoted to the "City at Large," including comprehensive planning, open spaces, parkways, distribution and location of parks, park development and temporary public decorations.

Undoubtedly the book will have a marked effect upon modern civic art, and one which will not be confined to this country. The valuable matter which it contains is logically arranged and is presented in remarkably good English. The chief faults of the book are diffuseness, some repetition, and occasional examples of over-fine writing. It is a volume which will appeal to people of culture, but is not thoroughly suited to those whose attention needs to be both aroused and held. All classes of readers would have been far better served had the volume been illustrated. There are many references to street plans, notable avenues, bridges, memorial arches, water gates and fountains, which need to be accompanied by illustrations to be most effective or in some cases to be of any material service to people who have not seen the objects mentioned. Pleasant to the eye as is the unusually large type, the mission of the volume would have been better fulfilled had the saving which might have been effected by the use of smaller type been put into illustrations. Perhaps a supplementary volume, with numerous illustrations, is being held in reserve. Such a publication would receive a hearty, and, we trust, a wide welcome.

MOSQUITO EXTERMINATION IN PRACTICE.—Lawrence, L. I.: Board of Health. Paper; 7 × 10 ins.; pp. 42; folding map. 25 cts.

The mosquito extermination work of this board has been along the sensible lines of blotting out all breeding places, so far as possible, and of applying crude petroleum oil to such water areas only as could not be given permanent treatment. As more funds become available the necessity for oiling will diminish rapidly. The permanent work has consisted largely of ditching, both for drainage, and, in the case of pools in salt water marshes, to ensure the full sweep of every tide. Attention has also been given to trimming the edges of ponds to prevent shallow water and overhanging vegetation. Uncovered rain barrels and similar breeding places have been looked after. The expense of ditching, some 1,500 in all, has been met by private subscription. Other expenses were covered by a village appropriation of $1,000. Mr. Edward Bentley is President, and Mr. Newbold T. Lawrence is Secretary of the Lawrence Board of Health. Mr. Leonard Coombs was employed as superintendent of the work, and Mr. Chas. B. Bennett as expert inspector. The latter contributes 15 pages of observations on the three kinds of mosquitoes encountered in his work. The most numerous, at Lawrence, is the salt-marsh variety, Culex Solicitans. Next comes the rain-barrel variety, Culex Pipiens. Finally, there is the malarial type, anopheles. These were not found in great numbers at Lawrence, "but in those ponds on whose edges grass or water plants were growing, there were always some." They "hide in the vegetation and thus evade fish," but in ponds containing fish, and having edges free from vegetation, none have been found. Only a little vegetation is required to shelter the wrigglers, thus making it difficult to guard against anopheles by trimming the edges of ponds. Where drainage cannot be effected, or the ponds are desired for ornamental or other purposes it is advisable to provide "perpendicular edges made of brick or cement."

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AMERICAN PARK AND OUTDOOR ART ASSOCIATION.—Park Commissioners' Session of the Sixth Annual Meeting, Boston, 1902. Vol. VI., Part 4. Rochester, N. Y.: Charles M. Robinson, Secretary. Paper; 6 × 9 ins.; pp. 30. 25 cts. (to members only).

Most of this pamphlet is occupied by five papers on various phases of parks and park management, including "Parks and Landscape Gardening," by Byron Lathrop, of Chicago, and "Park Administration," by Calvin C. Laney, of Rochester. These and the other papers contain many valuable suggestions for both park officials and urban citizens.

The Inception, Growth, Decline and Future of Water Transportation in England.

THE CANAL SYSTEM OF ENGLAND.—Its Growth and Present Condition, with Particular Reference to the Cheap Carriage of Goods. By H. Gordon Thompson. Published for the Cobden Club, by Request. London: T. Fisher Unwin. Paper; 6 × 7 ins.; pp. 70. Paper, 60 cts. net; cloth, 80 cts. net.

This is an interesting review of the inception, rise and decline of inland navigation in England, coupled with suggestions for inaugurating a further era of usefulness for water transport as based upon present conditions. Commencing with the Exeter Ship Canal of 1572, and including the canalization of rivers in the 17th century and the 361 miles of canals proper built by Brindley for the Duke of Bridgewater and other promoters, the total lengths of the canal system of England in 1830 aggregated 4,700 miles, and the total cost was about $70,000,000. As a rule, the early canals were very prosperous, for they vastly reduced the cost of transportation. For example, the building of the Bridgewater Canal between Manchester and Liverpool, about 1765, reduced the cost of sending goods between these two places from 40 shillings to 6 shillings per ton, and gave a much better service than the old horse-hauling method over bad roads. In 1761 it was estimated that the total traffic between Liverpool and Manchester was about 40 tons per week, or 2,000 tons per year, costing for carriage alone 1 shilling per ton-mile; in 1890, three years before the opening of the Manchester Ship Canal, the traffic between these two cities was not less than 10,000,000 tons per year, and the cost of transit was 3 to 8 shillings per ton for the whole distance. But the introduction of railways into England, in 1830-40, very materially affected the prosperity of the canal system; and what added to the almost immediate downfall of water transportation was the fact that, though some of the principal canals were paying dividends of 20 and 30% in 1846, the owners, expecting that their capital would be rendered valueless, attempted to compel the railway companies to purchase their canals. The railway companies were not slow in taking advantage of this opportunity to stifle future competition, and in the period 1845-48 they actually obtained possession of 1,000 miles of waterways, and subsequently increased this total to 1,264 miles; and by 1883 the railways had practically strangled the whole system of inland water traffic.

The author then goes on to describe and discuss the Manchester Ship Canal and the present condition of inland transport in England. He finds that the structural condition of the English barge-canal system is deplorable, with small section, light draft, and inadequate lack of capacity; and the old method of horse-haulage is still in use on most of these canals. He suggests the adoption of a standard and greater depth and sectional area, more modern methods of changing from one level to another, and steam instead of horse haulage. He claims that the average cost of horse haulage is 0.33d. per ton-mile; and the substitution of steam haulage would mean a saving of $60 in hauling 100 tons 100 miles. The system preferred is that now used on the Aire and Calder navigation, where a steam tug hauls a train of 40-ton boats or floating tanks carrying coal; in 1883 this system cost 0.0087d. per ton-mile. And for moving 4,000,000 tons of merchandise by cargo-carrying tugs the cost was 0.03d. per ton-mile. Mr. Thompson describes the Siemens-Halske system of boat traction by electric locomotives, and the experiments with the Leon Gerard and Thwaite-Cawley electric systems. He says that chief among serious drawbacks to inland navigation are the prevailing slow rate of speed and the very great variety of control and differing rates of toll. Electric hauling may correct the first objection, and consideration of interests, freedom from railway control and improved administration may do much toward increasing the general usefulness of canals. The author closes with a general review of his subject, and argues that as the railway rate of 1.4d. per ton-mile is greater than that of any other country there is profit in inaugurating a better canal system in England.

RODMAN'S MANUAL.—By Nicholas Daubeney Monsarrat, Jun. Am. Soc. C. E., Longacre, W. Va. Paper; 3 × 5 ins.; pp. 20; illustrated. Published by the author.

The author gives a few plain directions, accompanied by original sketches, for holding level rods, and for the exchange of signals between rodmen and instrument men. He also presents a few hints on surveying.

SPECIFICATIONS FOR MATERIAL AND WORKMANSHIP FOR STEEL STRUCTURES.—American Railway Engineering & Maintenance of Way Association, 1562 Monadnock Block, Chicago. Paper; 6 × 9 ins.; pp. 8. 10 cts. (or 5 cts. for orders of 10 or more.)

These specifications were submitted at the last meeting of the Association, by the Committee on Iron and Steel Structures. After some discussion at the meeting they were adopted by the Association, and have now been published in pamphlet form.

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"The Panama Canal Question from a Colombian Standpoint" is set forth by a native Colombian, Raûl Perez, in the July "North American Review." Mr. Perez sums up the Colombian side of the question at the outset as follows:

(1) Neither the Colombian Executive nor an ordinary Congress can constitutionally ratify a treaty that involves a cession of territory to a foreign power.
(2) The canal will not be of as much benefit to Colombia as those who are unfamiliar with the situation believe.

According to Mr. Perez, while Colombia now derives a very considerable benefit from the traffic across the Isthmus, all this benefit would practically disapear if the canal were opened and ocean steamships sailed from ocean to ocean through it without stopping. "All the nations of the world would benefit by it rather than Colombia," says Mr. Perez. As for the $10,000,000, which Colombia is to receive under the Hay-Herran treaty, Mr. Perez takes the ground that it is a mere pittance in proportion to the value of the franchise granted, and he declares that even $50,000,000 would be inadequate compensation. Nevertheless he declares that patriotic Colombians would like to see the United States build the canal, but they would vastly prefer that Colombia should retain a partnership interest in it and share in its profits than that she should dispose of all her rights for any lump sum of money. One reason for this is that the clerical party now in power, according to Mr. Perez, would distribute the money among the dictator's clique and the clerical orders, and the nation itself would receive no benefit. In fact, from Mr. Perez's position, it would be "injured, for the funds would be used by the party in power to firmly fasten its hold upon the nation."

Two articles in the July "Review of Reviews" are devoted to recent floods and fires. Mr. Chas. M. Harger tells of the floods which devastated parts of Kansas, Missouri and Iowa, and Mr. H. M. Suter writes on "Forest Fires in the United States," with especial reference to those which prevailed in the East during the drought, in May and June. Another "Review of Reviews" paper deserving mention here is entitled "The Erie Canal, Its Past and Future." by M. M. Wilner. The writer merely sets forth in popular form the arguments for the 1,000-ton barge canal which have been discussed at various times in these columns. From the statements which he makes he is evidently wholly ignorant of the report of the United States Deep Waterway Commission. A journal of such standing as the "Review of Reviews" ought to present such a subject to its readers from a broader standpoint. Still another article in the same magazine deserving a word of mention here relates to the work done by the American Bridge Co., represented by Messrs. A. B. Lueder and N. P. Jarrett, in the construction and erection of 27 bridges on the Uganda Railway.

In the "Atlantic" for July the principles of municipal school administration are discussed by Mr. W. H. Burnham, and the results of the experience of various cities in the introduction of reforms in school management are set forth. In the same magazine we find an interesting review of the work of the Cuban government during its first year. Very few residents of the United States outside of those having special interests in Cuba are aware how well and successfully the young republic, for whose creation this nation was responsible, has administered its affairs.

A "Scribner" article this month describes the work of the log drivers and raft men on Canadian rivers, and particularly the descent of the Ottawa and its dangerous rapids.

In the "Cosmopolitan" we find a paper on the Temple of Philae, on the Nile, soon to be partially submerged by the waters held back by the Assouan dam

In "McClure's" for July, the notable series of papers on the history of the Standard Oil Trust is completed, or rather the first series. A second series by the same author is promised in the fall. In "McClure's" also we find a notable paper on Philadelphia and its municipal government—or misgovernment. The author is Mr. Lincoln Steffens, who has contributed previous papers to the same magazine on the municipal corruption in Minneapolis and elsewhere. According to this paper the Philadelphia ring has a plan on foot to sell or lease the city's water-works to a private company; but the plan has been shelved for the present through the refusal of Mayor Weaver to approve such a scheme.

In the "Contemporary Review" for June, M. Pierre Baudin, late Minister of Public Works of France, writes on the French internal navigation system. He states that the average freight rate per ton-kilometer on the whole French canal system is 1 centime, on the French railways it averages 4.2 centimes. It should be pointed out, however, that this comparison is between wholly unlike things, for on the waterways the fixed charges and cost of maintenance of the waterway are borne by the Government, while on the railway they are paid by the shippers of goods. Besides this, the traffic on the waterways is largely of bulk freights, which are handled and shipped on the railway at much lower rates than the average of freight.

In the "Nineteenth Century" for June, Mr. Alfred Stead writes on "Conquest by Bank and Railways," referring especially to the Russian occupation of Manchuria and its results in establishing Russian supremacy there.

"The Century" this month bears on its front cover page the legend, "Nine Complete Stories," and one of them is good enough and of engineering interest enough to deserve mention here. The scene of the story is the famous Nile barrage, a structure, as most of our readers know, founded not on rock but on the shifting alluvial bed of the Nile. A sudden and serious leak appears in the midstream section and the English engineers in charge are at their wits end to know what to do. The structure is saved by the quick wit of an Egyptian boy who has been doing menial work about the engineer's house. He secures some blue dye from the bazaar, goes out in the stream above the dam in a rowboat and finds the location of the leak in the edge of the rubble apron a quarter of a mile above the barrage. The leak once discovered, it is a short matter to stop it, and then the boy of 14 is brought before the engineer and questioned as to where he gained the knowledge that enabled him to save the dam. He explains that his father was Chief Engineer of the Khalifa and was killed by Kitchener's troops in the battle of Omdurman, and that from him he learned the use of blue dye for finding leaks in canal embankments.

CHARLES RIVER DAM.—Report of the Committee Appointed in 1901 to Consider the Advisability of Building a Dam Across the Charles River at or Near Craigie Bridge. Henry S. Pritchett, Samuel M. Mansfield and Richard H. Dana, Committee; Joseph W. Lund, Secretary; John R. Freemon, M. Am. Soc. C. E., Chief Engineer. Boston; Pub. Doc. Cloth; 6 x 9 ins.; pp. 579; many maps, diagrams and other illustrations.

This report has been received too late to be given the extended notice which it deserves, but we desire to bring it to the immediate attention of our readers in order that those interested may take steps to secure copies before it is too late. Briefly stated, the proposed dam is designed for the sanitary improvement of the area above the Craigie St. bridge, which latter connects Boston and Cambridge; and for the formation of a water park, which would supplement the Boston, Cambridge and metropolitan park systems. The bulk of the volume is taken up with Mr. Freemon's report on the dam and many allied questions of engineering and sanitation. There are 20 appendixes by Mr. Freeman, Dr. Theobald Smith, H. W. Clark, X. H. Goodnough, Hiram F. Mills, William Jackson, L. M. Hastings, and others. In these appendixes there are discussed the relation of the dam to mosquitoes and malaria; the pollution of the river and of the Fens basin; the geology of the section; harbor currents and scour; the effect of the proposed basin on air temperatures; and the subsidence of the land and the harbor bottom. An abstract of the appendix dealing with the latter subject was printed in Engineering News of June 18, 1903.

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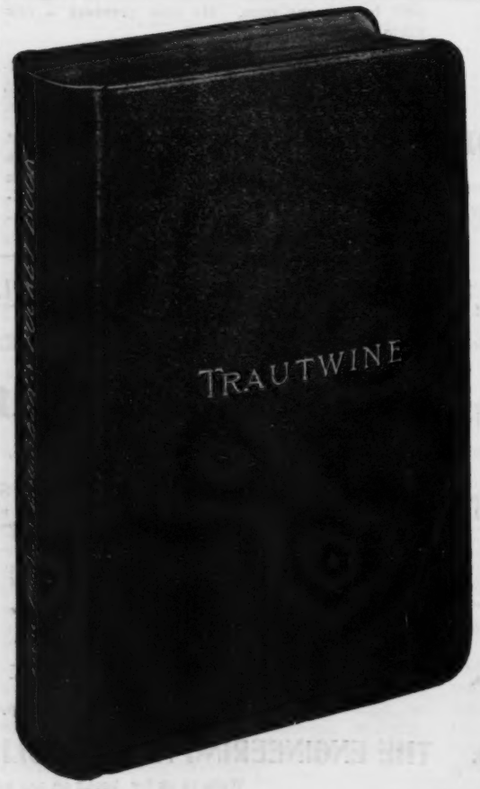

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